Deloro Village Environmental Health Risk Study

Summary Report of Air, Settled Dust, and Drinking Water Sampling and Analysis Activities

Final Report

CG&S

CH2M Gore & Storrie Limited

Deloro Village Environmental Health Risk Study

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Final Report

Prepared for:

ONTARIO MINISTRY OF THE ENVIRONMENT

Prepared by:

CG&S
CH2M Gore & Storrie Limited

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Executive Summary

The former Deloro Mine/Refinery is located in Hastings County, Ontario, about 8 km east of Marmora and 45 km north of Belleville. For a century, hazardous chemicals and materials have been handled and stored on the Deloro site. The various smelting and refining operations, although lucrative, were extremely harmful to the surrounding environment. Since the 1960s, the Ontario Ministry of the Environment (MOE) has steadily been taking steps to assess and remediate the pollution and its effects, on- and offsite.

In September 1998, CH2M Gore & Storrie Limited (CG&S) was retained by the MOE to assist in a comprehensive evaluation of the exposure and potential risk to residents of the Village of Deloro, Ontario, by the former Deloro Mine/Refinery. CG&S was contracted to provide overall project management and coordination as well as perform some of the environmental sampling for indoor and outdoor dust and drinking water. With CG&S acting as the main consultant, a number of subconsultants/contractors were retained to assist with different aspects of this study.

This report is entitled Deloro Village Environmental Health Risk Study Summary Report of Air, Settled Dust, and Drinking Water Sampling and Analysis Activities. It summarizes the activities performed as outlined in CG&S's proposal dated August 18, 1998; addendums dated August 19 and 24, 1998, and the subsequent Task II Sampling and Analysis Plan (SAP) dated November 5, 1998. The results of those activities are included in this report. The SAP was developed by CG&S in consultation with the subconsultants, the risk assessment team, and the Deloro Health Risk Study Technical Steering Committee to ensure completion of the overall project objectives as outlined in the Technical Steering Committee's Terms of Reference for the Deloro Village Environmental Health Risk Study.

Task II focussed on the collection and analysis of samples of indoor and outdoor air and settled dust and drinking water in the Village of Deloro. LEX Scientific Inc. was retained to perform indoor and outdoor air and dust sampling activities. CANVIRO Analytical Laboratories Ltd. and Bequerel Laboratories Inc. were retained to perform analyses of samples for metals and radionuclides, respectively. A complete description of the results from these activities is included in this report.

This report was prepared in parallel with several other reports, as defined by the Terms of Reference. The results of the other tasks are documented in reports prepared by the MOE and other consultants as part of the Environmental Health Risk Study. These comprise:

- 1998 Phytotoxicity Report comprised of soil survey and backyard garden vegetable sampling and results, prepared by the MOE
- The Results of Environmental Radiation Monitoring, prepared by SENES Consultants Ltd.
- Deloro Village Environmental Health Risk Study comprised of biological monitoring results, prepared by Goss Gilroy Inc.

The results of these reports provide the background information for the development of the subsequent and final reports of this study, including:

- Exposure Assessment and Health Risk Characterization for Arsenic and Other Metals, prepared by CANTOX Environmental Inc.;
- Exposure Assessment and Health Risk Characterization for Radionuclides, Gamma Radiation, and Radon, prepared by SENES Consultants Ltd.; and
- Overall Technical Summary Report, prepared by CG&S.

The analytical results of all samples collected were compared to available provincial and federal guidelines and reference location samples. Reference location samples were taken for all air and dust media in the Marmora Township office (Reference Location 1) and at the southwest edge of the Village of Deloro (Reference Location 2).

There were detects of metals (concentrations greater than the laboratory reporting limit) in less than half of the 80 outdoor air samples but all samples had detects of radionuclides. None of the detects of metals exceeded current outdoor ambient air quality guidelines. There are no criteria for radionuclides for comparison. Metals concentrations in outdoor air were generally higher than at Reference Location 1 and generally the same as at Reference Location 2. The radionuclide concentrations were generally higher than at Reference Location 1 and generally lower than at Reference Location 2.

Most of the seven road dust samples had detects of metals (with the exception of silver) and radionuclides. There are no criteria for outdoor settled dusts for comparison. Metals levels at Reference Location 1 were generally less than or equal to metals levels in the study area samples with the exception of arsenic. Arsenic levels in study area samples exceeded the arsenic levels at Reference Location 1 in six of seven samples. Metal levels at Reference Location 2 exceeded or equalled study area levels in almost all cases. As a result, Reference Location 2 would appear to have similar environmental conditions as those locations within the study area. Radionuclide levels in the study area were generally higher than those found at Reference Locations 1 and 2.

Seven of the eight exterior surface dust samples had detects in both metals and radionuclides. The remaining sample had neither. Location 6 had the highest lead concentration, likely due to its proximity to a gravel road and playing field. No criteria for exterior surface dust are available. Metal levels found in the study area generally exceeded or equalled metal levels found at Reference Location 1. There is no apparent trend in metal and radionuclide levels found within the study area as compared to Reference Location 2.

The outdoor dustfall samples contained debris that accumulated in the sampling containers. As a result, possible interference resulted in increased method detection limits for the outdoor dust samples. Of the ten sample locations, two locations only contained detectable levels of arsenic. Both of these sample locations were located adjacent to the Deloro Mine Site. The values measured for lead did not exceed the lead dustfall criteria.

There was only one detect for indoor air (nickel at 0.403 $\mu g/m^3$), and it is well below criteria. All metal concentrations in indoor air were higher than Reference Location 1 but similar to, or less than, Reference Location 2.

Other than detects of nickel, less than one third of the indoor swipe samples had detects of metals, radionuclides, or total radioactivity. There are no available criteria for indoor swipes. With the exception of nickel, the metal levels in indoor swipes in the study area were similar to Reference Location 1. Nickel levels were primarily higher in the study area samples than at Reference Location 1. The metal levels in study area samples were generally similar to, or greater than, at Reference Location 2. The measurable levels of radionuclide activity for the two reference locations were generally greater than the levels within the study area.

Other than detectable levels of lead in four, nickel in 15 and Pb-210 in six of the 56 indoor dustfall samples, there were no detects of metals or radionuclides. Total radioactivity was detected in about one third of the samples. Levels were corrected for a 30-day interval and compared to background levels, as there are no available criteria other than for lead. None of the samples exceeded the lead criteria, and metal concentrations in indoor dustfall in the study area were generally lower than at Reference Location 1 and Reference Location 2. The measurable levels of radionuclide activity for the two reference locations were generally equal to or less than the levels within the study area; however, the total radioactivity was generally equal to or greater than the background levels.

There were two exceedences of criteria in drinking water, both in first-draw samples for lead. This is typically a result of water piping containing lead alloys and the reason that Health Canada recommends flushing tap water prior to consumption. No other private well samples for metals or radionuclides exceeded guidelines. None of the municipal well samples exceeded the drinking water guidelines.

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1. Introduction

Background

The former Deloro Mine/Refinery is located in Hastings County, Ontario, about 8 km east of Marmora and 45 km north of Belleville (Figure 1-1). Situated where the Canadian Shield intersects with the Great Lakes Lowlands, the area is rich in mineral deposits. For a century, hazardous chemicals and materials have been handled and stored on the Deloro site. The various smelting and refining operations, although lucrative, caused environmental contamination. Since the 1960s, the Ontario Ministry of the Environment (MOE) has been taking steps to assess and remediate the contamination and its effects, on- and offsite.

In September 1998, CH2M Gore & Storrie Limited (CG&S) was retained by the MOE to assist in a comprehensive evaluation of the exposure and potential risk to residents of the Village of Deloro from contamination relating to the former Deloro Mine/Refinery. CG&S was contracted to provide overall project management and coordination, as well as to perform some of the environmental sampling. CG&S, acting as the prime consultant, retained a number of subconsultants/contractors to assist with the environmental sampling component of the investigation. LEX Scientific Inc. (LEX) was subcontracted for its expertise in air and dust sampling and to perform sampling of indoor and outdoor air and settled dust. The results of LEX's sampling activities are included in this report. CANVIRO Analytical Laboratories Ltd. (CANVIRO) and Becquerel Laboratories Inc. were retained to perform the analyses of samples for metals and radionuclides, respectively.

This report, Summary Report of Air, Settled Dust, and Drinking Water Sampling and Analysis Activities - Deloro Village Environmental Health Risk Study, summarizes the activities performed as outlined in CG&S's proposal dated August 18, 1998 with addendums dated August 19 and 24, 1998, and a subsequent Sampling and Analysis Plan (SAP) dated November 5, 1998, and the results of those activities. The SAP was developed by CG&S in consultation with the subcontractors/consultants, the risk assessment team, and the Deloro Health Risk Study Technical Steering Committee, to ensure completion of the overall project objectives as outlined in the Technical Steering Committee's Terms of Reference for the Deloro Village Environmental Health Risk Study, dated June 1998. The Deloro Health Risk Study Technical Steering Committee consisted of senior scientists from the MOE and the Ministry of Labour, and medical doctors from the Hastings and Prince Edward Counties Health Unit, the Ministry of Health, and the Toronto Hospital for Sick Children.

Project Objectives

The Terms of Reference divided the project into a series of seven major components that were designed to address the overall project objectives. Individual components were assigned by the Technical Steering Committee to selected consultants that could provide the relevant expertise. Major component ii) Environmental Sampling, Analysis and Reporting for Metals (herein referred to as Task II) was assigned to CG&S.

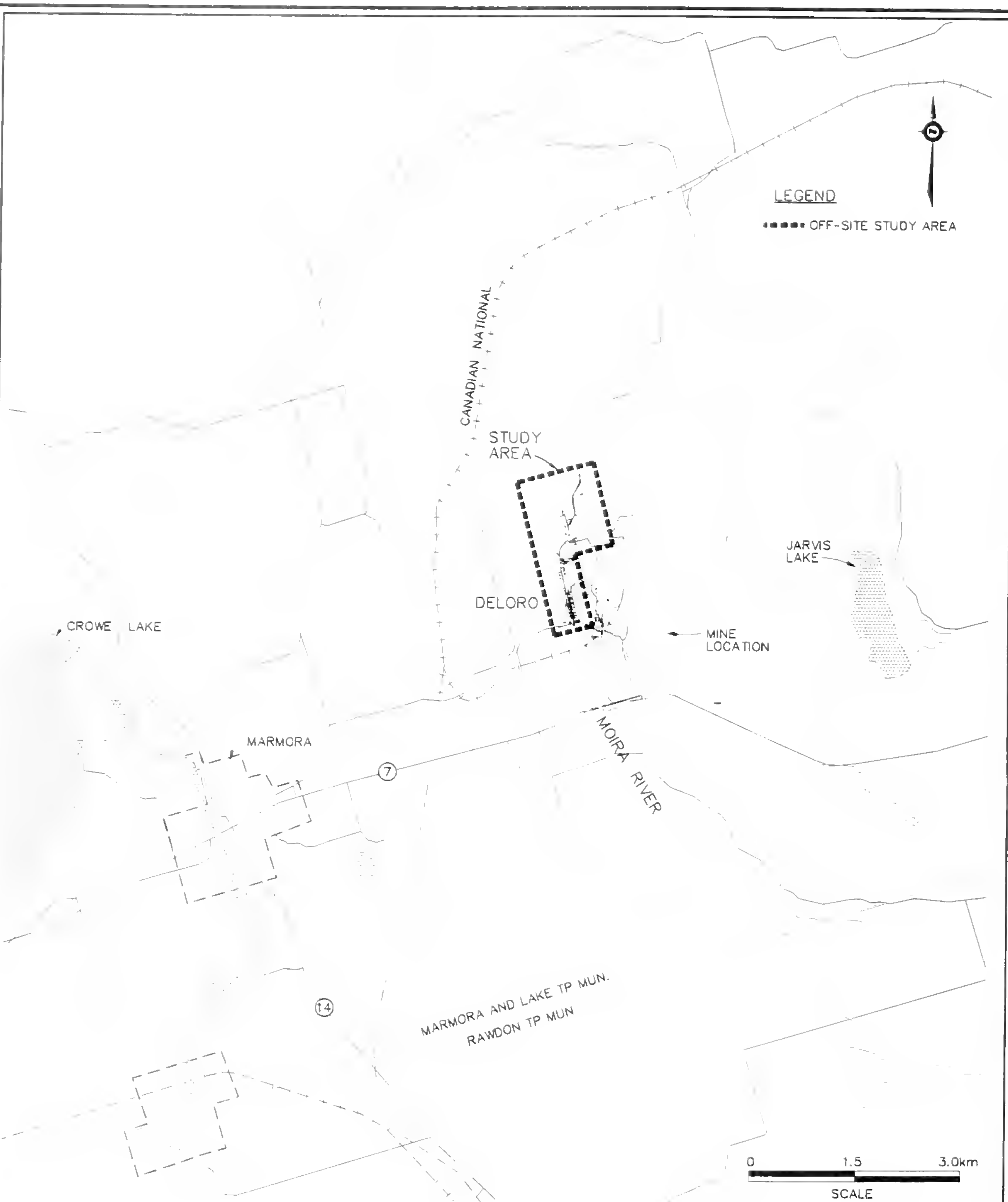

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Figure 1-1
Deloro Off-Site Study
Site Location

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The overall study objective related to environmental sampling, as specified in the Terms of Reference for the Deloro Village Environmental Health Risk Study, is as follows:

- To determine if there are elevated levels of contaminants from the former Deloro mine site present in the community in various environmental media (soils, indoor and outdoor dusts, indoor and outdoor air, drinking water, backyard vegetables).

Task II focused on the collection and analysis of samples of indoor and outdoor air and settled dust and drinking water in the Village of Deloro. The results of this environmental sampling are documented in this report. The results of the other tasks are documented in reports prepared by the MOE and other consultants.

Scope of Work

The original Scope of Work was defined in the Terms of Reference for the Deloro Village Environmental Health Risk Study, under major component ii) Environmental Sampling, Analysis and Reporting for Metals (Task II). Based on subsequent discussions with members of the consultant team selected by the Technical Steering Committee to implement the study, the requirements for the environmental sampling and analysis were revised to yield the following scope of work for Task II.

Indoor Air and Dust

- Determine the concentrations of selected metals (arsenic, nickel, silver, lead, cobalt) and uranium in indoor air and settled dust in all households willing to participate in the study, in public buildings in the Village of Deloro, and in two locations outside of the study area.
- Determine total radioactivity in indoor settled dust in all households willing to participate in the study, in public buildings in the Village of Deloro, and in two locations outside of the study area.
- Determine the concentrations of selected radionuclides (Po-210, Pb-210, Ra-226, and Th-230) in indoor settled dust from a subset of 15 households to allow the determination of the equilibrium ratios of these radionuclides within the uranium decay series.
- Compare the analytical results to applicable criteria (where available).
- Compare the results to typical Ontario concentrations (where available) and to results collected from outside of the study area as part of this study.

Outdoor Air and Dust

- Determine the concentrations of selected metals (arsenic, nickel, silver, lead, cobalt), selected radionuclides (Po-210, Pb-210, Ra-226, and Th-230), and uranium in outdoor air and settled dust at eight locations in the Village of Deloro and in two locations outside of the study area.
- Compare the analytical results to applicable criteria (where available).
- Compare the results to typical Ontario concentrations (where available) and to results collected from outside of the study area as part of this study.

Drinking Water

- Determine the concentrations of selected metals (arsenic, nickel, silver, lead, cobalt), selected radionuclides (Po-210, Pb-210, Ra-226, Th-230, Th-232, Cs-137, I-131, Sr-90, and tritium), and uranium in in-use private water supply wells in all homes willing to participate within the study area, and the municipal water supply well.
- Compare the analytical results to the Ontario Drinking Water Objectives (MOE, 1994), Guidelines for Use at Contaminated Sites in Ontario - Table A (MOE, 1997), and to Health Canada criteria (where ODWO values are not available).

Report Outline

The report is organized into four sections. The introductory section includes a discussion of the background to the project and the project objectives and outlines the scope of work. Section 2 of the report describes the methodology used to undertake the environmental sampling. Section 3 of the report provides a discussion of the results of the sampling program. Section 4 summarizes the major conclusions of the investigation.

The report has a number of Appendices that provide detailed information collected during the investigation. Appendix A provides a summary of the nature of private water supply systems in Deloro. Appendix B provides descriptions and photographs of the sampling locations. Appendix C provides details on analytical procedures used by the participating laboratories. A summary of collected weather data and analytical results is provided in Appendix D.

2. Methodology

Invitations to Participate

CG&S contacted the residents of Deloro to invite them to participate in the environmental health risk study. This initial contact ran concurrently with the contact made by Goss Gilroy Inc. (GGI) for the biological monitoring study.

Contact with residents to invite participation commenced on September 25, 1998 and continued throughout the duration of the field investigation phase of the study. Several attempts were made to contact all of the residents in person, followed by phone calls and letters. Upon contact, residents who wished to participate were asked a series of questions. The questions asked and a subset of responses can be found in Appendix A. All residents who were willing to participate and available during the sampling period were included in the study.

In addition, three public buildings and two reference locations were incorporated into the indoor and outdoor field investigations. Table 2.1 provides a summary of residences/buildings sampled.

TABLE 2.1
BREAKDOWN OF RESIDENCES/BUILDINGS SAMPLED FOR INDOOR AIR AND DUST INVESTIGATION

Description	Total	Participation
Deloro Residences In-Use	62	54 (87%)
Deloro Public Buildings	3	2
Reference Locations	2	2
Total		**58**

Public buildings in Deloro include the municipal well pump house, the town hall/library, and a youth centre, which is currently under construction (consequently indoor air and dust was not sampled there). Figures 2-1 and 2-2 show the locations of residences sampled during the indoor air and dust sampling program. Two reference locations sampling locations were established: 1) in the Town of Marmora; and 2) approximately one kilometre west of Deloro (see Figure 2-3).

In addition to the indoor air and dust sampling, a number of residences which use a private well for drinking water were identified and were included in the well water sampling investigation (Figures 2-4 and 2-5). Table 2.2 provides a summary of water supply source and water usage for homes in Deloro. The residents at two of the 17 homes that have a well do not use their well for drinking water. Information on the nature of the water supply systems is provided in Appendix A.

TABLE 2.2
SUMMARY OF WATER SUPPLY SOURCE AND WATER USAGE

Description	Number
Participating Deloro residences on municipal water	36
Participating Deloro residences that use a private well for drinking water	15

The environmental sampling program was completed between October 7, 1998 and November 17, 1998. Descriptions and photographs of the sampling locations are provided in Appendix B.

Quality Assurance/Quality Control Procedures

A rigorous quality assurance/quality control (QA/QC) program was developed and followed throughout the investigation to ensure the integrity of the results. The QA/QC program ensured that sampling protocols were defined so that samples were collected in a manner that allowed comparison to regulatory criteria. Sampling protocols are discussed in the following sections by sample media.

Sample submissions to CANVIRO and Becquerel Labs were tracked with chain-of-custody forms to ensure that samples were not misplaced or lost and to provide a record of the analysis to be performed. In addition, a number of QA/QC samples were submitted to ensure the integrity of the reported results. The QA/QC samples used in this investigation are categorized as follows.

- **Trip Blank** – Sample prepared by the lab that is taken to the study site but remains unopened and is returned to the lab for analysis along with the collected samples.
- **Field Blank** – Sample exposed to ambient conditions in the field and returned to the lab for analysis along with the collected samples.
- **Sample Duplicate** – Duplicate sample is taken in the field under conditions as close as possible to the original sample and is subjected to the same analysis as collected samples.
- **Lab Duplicate** – Sample created by the lab using a field sample either by splitting the sample prior to analysis or using the entire sample and repeating the analysis on the digestate.

Duplicate laboratory analysis for radionuclides was not undertaken due to the small sample masses involved and the requirement to use all of the samples to maximize the sensitivity of the analyses.

Outdoor Sampling

Weather Station

A weather station was installed by LEX at the CG&S Site Trailer located within the property limits of the mine site (Figure 2-6). This location was chosen as it is both representative of village conditions and secure from tampering and vandalism.

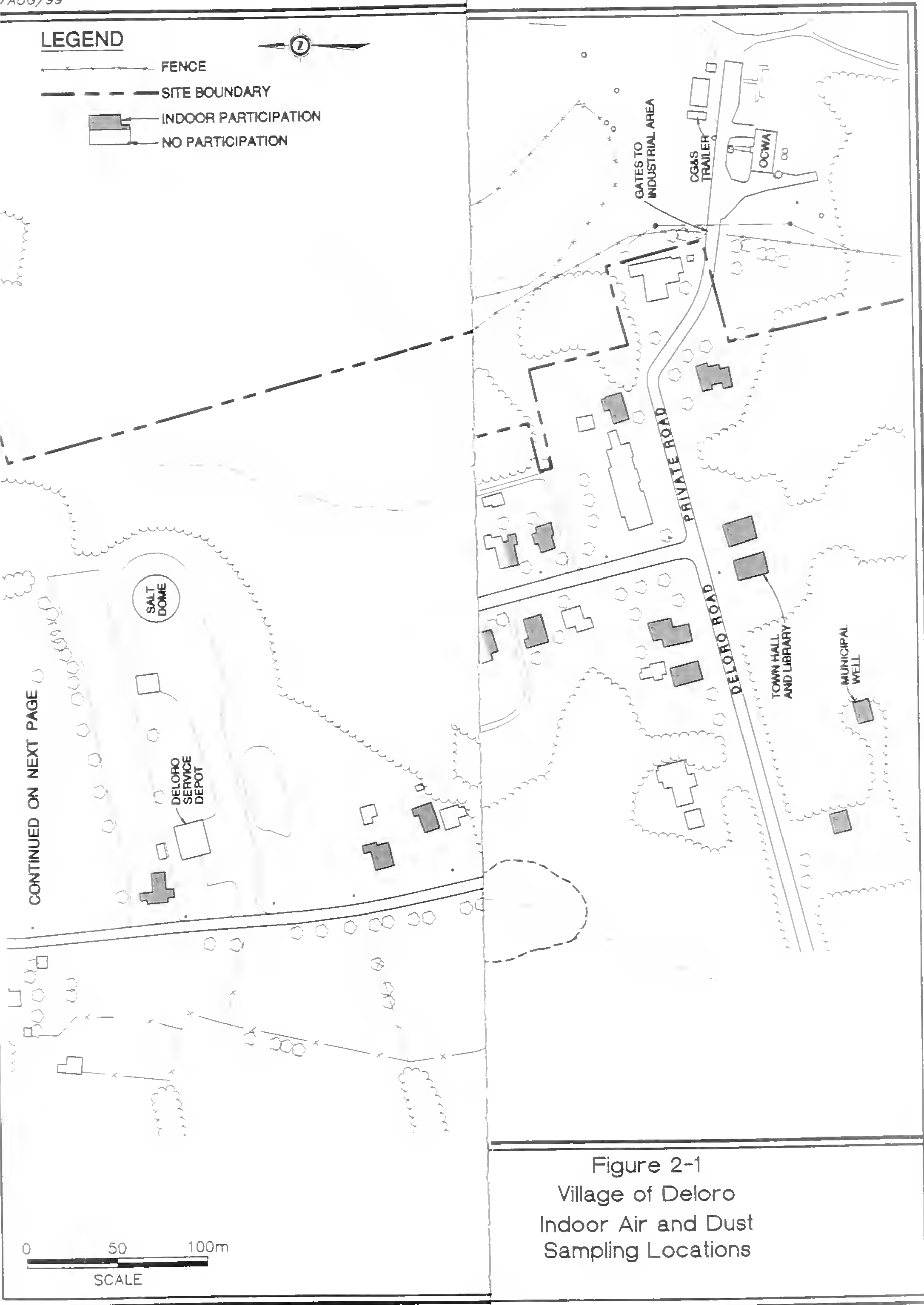

Figure 2-1
Village of Deloro
Indoor Air and Dust
Sampling Locations

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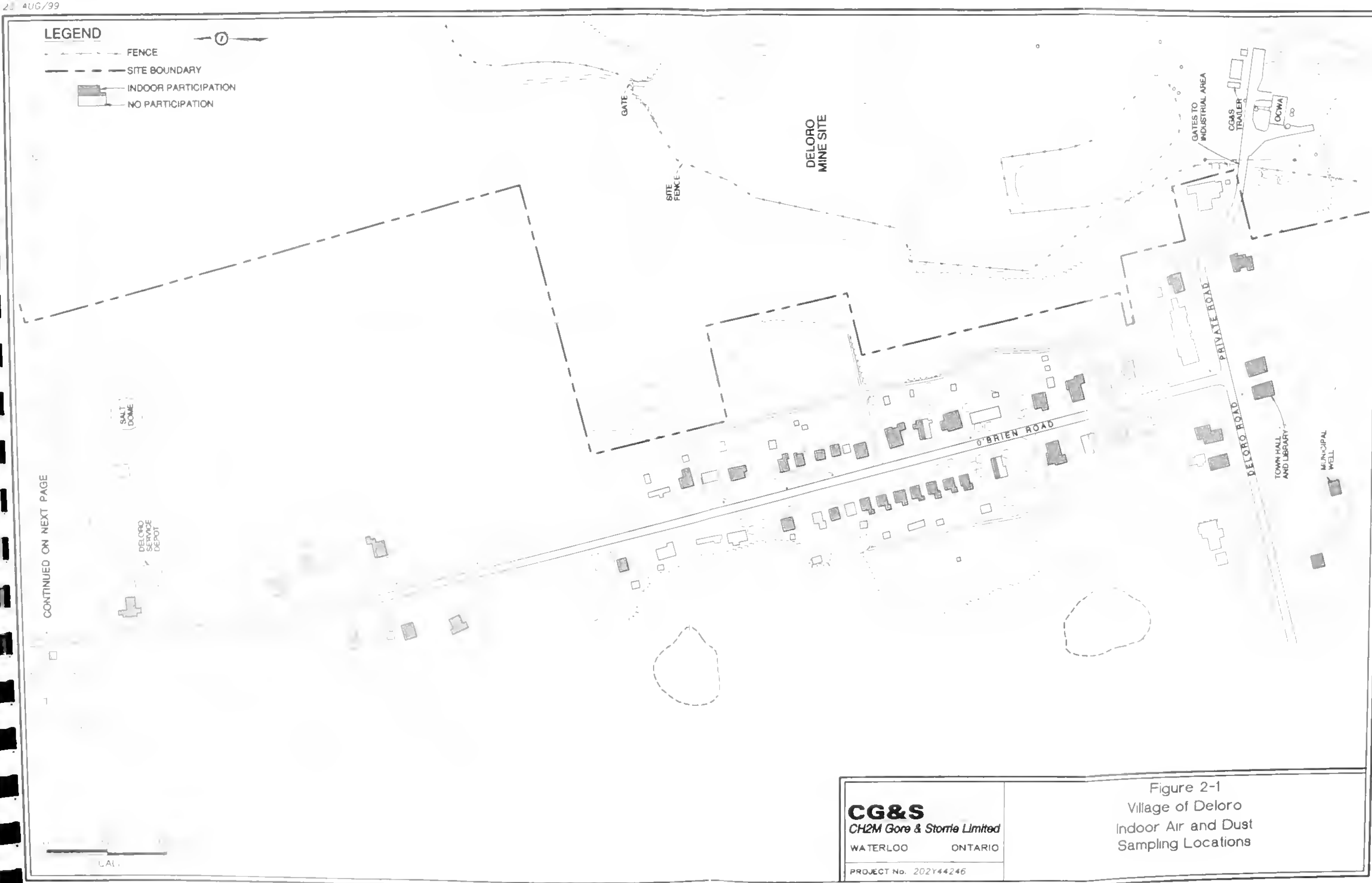

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Figure 2-1
Village of Deloro
Indoor Air and Dust
Sampling Locations

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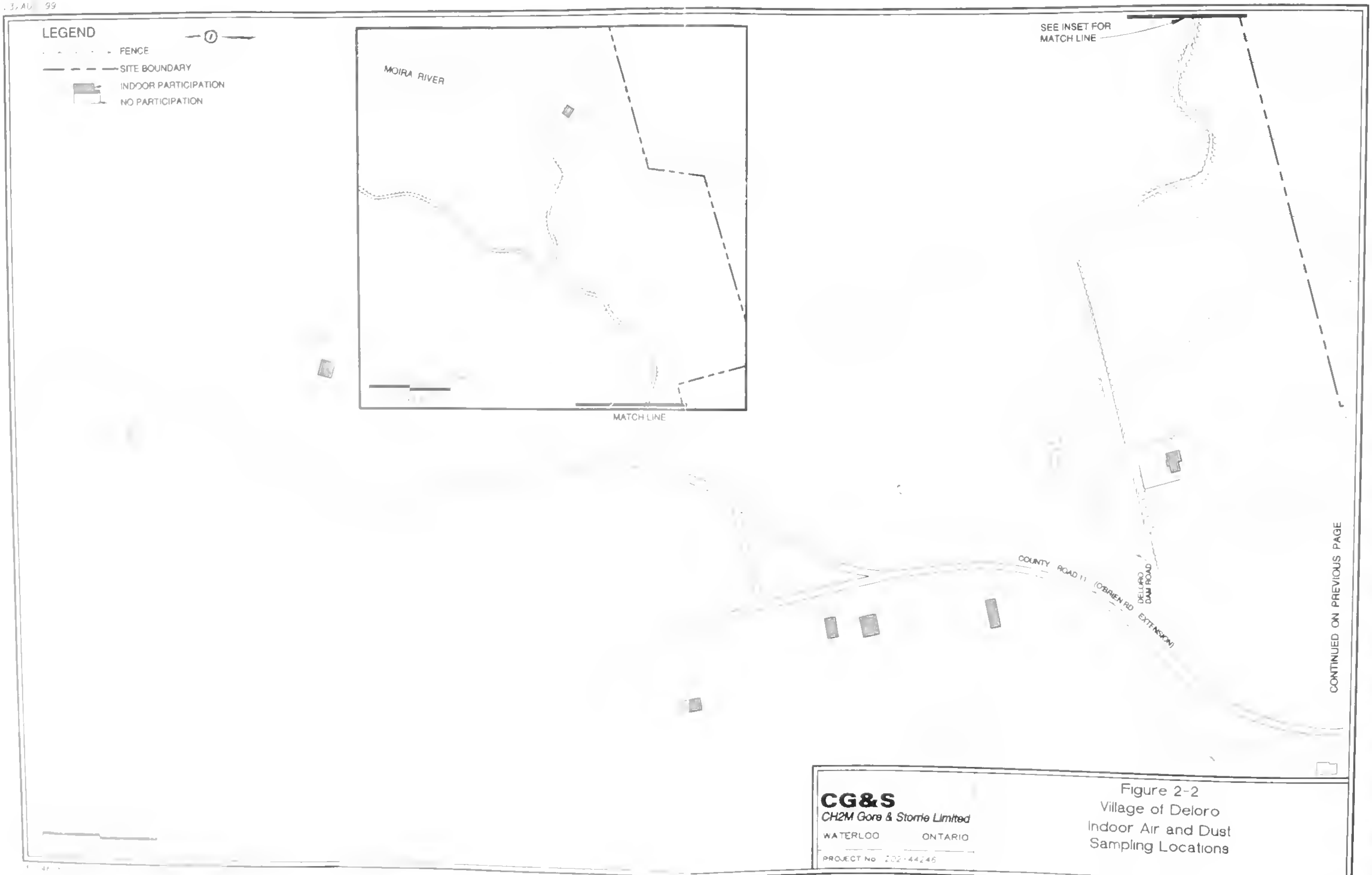

Figure 2-2
Village of Deloro
Indoor Air and Dust
Sampling Locations

The weather station recorded outdoor temperature, wind speed, wind direction, and rainfall on a data-logger during the site monitoring period. At fifteen-second intervals, readings were acquired for temperature, wind speed and wind direction. Temperature and wind speed readings were averaged over an interval of thirty minutes. The wind direction represents the dominant wind direction over the thirty minutes. The rainfall data was measured as daily total rainfall. The compiled data, as averaged and compiled by the software of the meteorological system, was downloaded and printed. The data included monthly summaries. Hourly barometric pressures for the month of October were acquired from the Ministry of the Environment (MOE) Trenton Station.

Outdoor Air and Dustfall

Sampling Locations

A total of ten outdoor air and dustfall sampling locations were selected. Eight of these locations were located throughout the village study area (Figures 2-6 and 2-7) and two of these locations were selected to represent reference locations conditions in the area (Figure 2-3). The ten locations were chosen following discussions between CG&S, the Technical Steering Committee, and other consultants involved in the study, and approved by the Technical Steering Committee. The rationale for the selection of the ten locations is summarized as follows:

1. Reference Location #1 – Town of Marmora, far removed from the mine site
2. Reference Location #2 – One kilometre west of Deloro
3. Town Hall/Library – Sensitive area
4. Mine Site Gates – Close to possible source of contamination
5. Salt dome/ Municipal Yard – High dust/ disturbed soil area
6. Northernmost Residence – Represents northern extent of study area and low traffic area

7-10. The main village area was divided into four quadrants. One station was set up in each quadrant and is representative of the respective residential area. Final locations were determined based on resident permission and an available power source.

Appendix B presents photos and descriptions of the outdoor air and dustfall locations.

Sampling Methodology – Outdoor Air

Suspended particulate matter samples were acquired at ten fixed sampling locations. Air samples were obtained at each location using high volume air samplers operating continuously for a 24-hour period. Samples were collected for the duration of the indoor air sampling program (i.e. one 24-hour sample at each of 10 locations for 10 days). The samples were acquired on 20 cm x 25 cm glass fibre filters (Whatman Glass Microfibre Filter). The collected samples were split to allow parallel analyses for metals and radionuclides.

The high volume air samplers were calibrated in situ, prior to the commencement of sampling, and again upon completion of the outdoor air sampling activities. If the calibration curves were outside of ±10 percent, the conservative lower flow rate was applied in calculating the sample volume.

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Figure 2-4
Village of Deloro
Residences Serviced by
Municipal Well and Private Wells

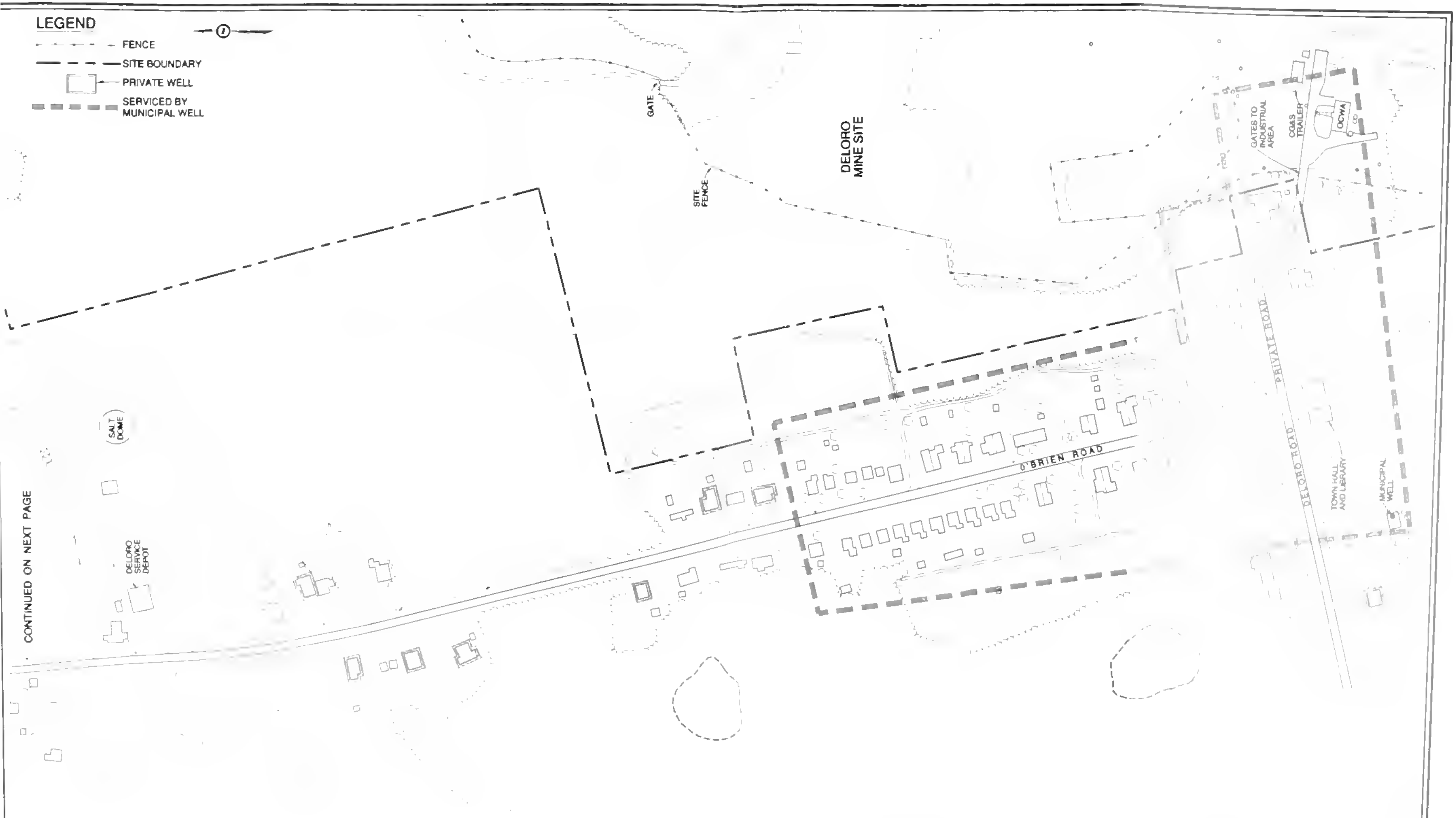

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Figure 2-4
Village of Deloro
Residences Serviced by
Municipal Well and Private Wells

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Figure 2-5
Village of Deloro
Residences Serviced by Municipal Well and Private Wells

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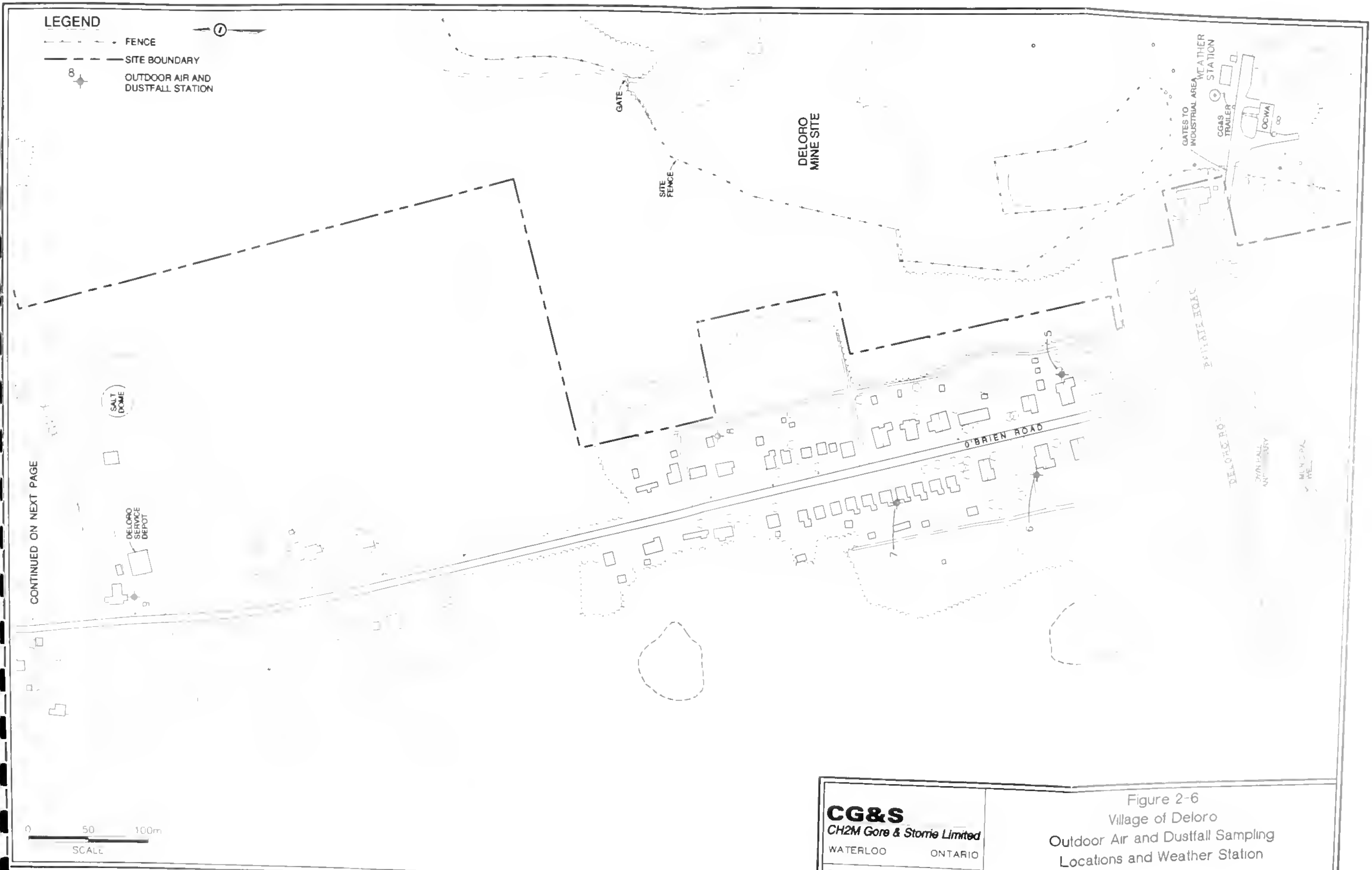

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Figure 2-6
Village of Deloro
Outdoor Air and Dustfall Sampling Locations and Weather Station

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Figure 2-7
Village of Deloro
Outdoor Air and Dustfall Sampling Locations and Weather Station

Sample information with respect to labelling, location, times, and flow rates was recorded onsite. No sample preservatives were used. Filters were handled in the field to minimize sample losses or cross-contamination. The samples were carefully folded in half to contain the trapped particulate and placed in a labelled paper envelope. Trip blanks, field blanks, and sample duplicates were submitted as part of the QA/QC program for the outdoor air samples. Chain-of-custody records accompanied each shipment to the laboratory.

Air samples acquired from one sample day (October 15 – 16) were selected for further radiological analyses for Th-230 and Po-210. This date was chosen based on wind patterns that placed the Village of Deloro downwind of the mine site (i.e. winds originated from the east/southeast).

Table 2.3 summarizes the number of samples collected, QA/QC samples and the analyses performed. Pump malfunctions occurred on two occasions of 100 and, as a result, no sample was obtained.

TABLE 2.3
ANALYSES PERFORMED ON OUTDOOR AIR SAMPLES

Sample Description	Number of Samples	Parameters Analyzed
Radionuclides		
Outdoor air	98	Ra-226, Pb-210
Outdoor air – subset	10	Th-230, Po-210
QA/QC		
Trip blanks	2	Ra-226, Pb-210
Field blanks	4	Ra-226, Pb-210
Field blanks	2	Po–210
Field blanks	1	Th-230
Lab duplicates	5	Ra-226, Pb-210, Po-210
Metals		
Outdoor air	98	As, Co, U, Pb, Ni, Ag
QA/QC		
Trip blanks	2	As, Co, U, Pb, Ni, Ag
Field blanks	5	As, Co, U, Pb, Ni, Ag
Sample duplicates	5	As, Co, U, Pb, Ni, Ag
Lab duplicates	7	As, Co, U, Pb, Ni, Ag

Sampling Methodology – Outdoor Dustfall (30-day)

At each of the ten outdoor air sampling locations, outdoor dustfall samples (in duplicate) were also collected. The principle of the method is that airborne particles are collected by settling into an open container over a known period of time. The sampling period was thirty days.

Sample information with respect to labelling, location and times was recorded on site. No sample preservatives were used. Media were not touched by hand prior to submission to the laboratory. The sampling container was washed with distilled water to transfer the collected materials prior to submission to the laboratory. Duplicate samples were collected to allow for parallel analyses of metals and radionuclides. QA/QC samples included one blank wash of the sample transfer bags and of the sample collection media, respectively. Chain-of-custody records accompanied each shipment to the laboratory.

Table 2.4 summarizes the number of samples collected, QA/QC samples and the analyses performed.

TABLE 2.4
ANALYSES PERFORMED ON OUTDOOR DUSTFALL SAMPLES

Sample Description	Number of Samples	Parameters Analyzed
Radionuclides		
Outdoor dustfall	10	Ra-226, Pb-210, Th-230, Po-210
QA/QC		
Trip blank	1	Ra-226, Pb-210, Th-230, Po-210
Metals		
Outdoor dustfall	10	As, Co, U, Pb, Ni, Ag
QA/QC		
Trip blanks	2	As, Co, U, Pb, Ni, Ag
Lab duplicate	1	As, Co, U, Pb, Ni, Ag

Road and Exterior Surface Dust

Sampling Locations

Ten locations for road dust and exterior surface dust sampling were selected. Eight of these locations were located throughout the village study area (Figures 2-8 and 2-9). Two of these locations were selected to represent reference locations conditions in the area (Figure 2-3). The ten locations were chosen following discussions between CG&S, the Technical Steering Committee and other consultants involved in the study, and approved by the Technical Steering Committee. The rationale for the selection of the ten locations is summarized as follows:

1. Reference Location #1 – Town of Marmora, far removed from the mine site.
2. Reference Location #2 – One kilometre west of Deloro.

3-10. Located throughout the village study area with a higher density in the residential area.

Appendix B presents photos and descriptions of the road dust and exterior surface dust locations.

Sampling Methodology – Road and Exterior Surface Dust

Sampling of road and exterior surface dust was performed on October 25, 1998 following five days of dry weather. Road and exterior surface dust samples were taken as near to each other as possible. All road dust sampling locations were paved surfaces except for Location 6, which was a gravel road. Exterior surface dust sampling locations included road signs, mail boxes, and a shed.

The sampling protocol was the same for both road and exterior surface dust sampling. A 10-cm by 10-cm square template and a sharp-edged metal tool were used to accurately mark out a 100-square-centimetre area. New latex gloves were worn during sampling at each location. At each location, a new sterile cotton swab was saturated in 10 percent dilute nitric acid. The swab was used to thoroughly wipe the 100-square-centimetre surface in two directions, the second perpendicular to the first. The used swab was then placed in a pre-cleaned sample bottle provided by the laboratory. The procedure was then repeated using a fresh swab. Both swabs were stored in one bottle and labelled appropriately with sample site information.

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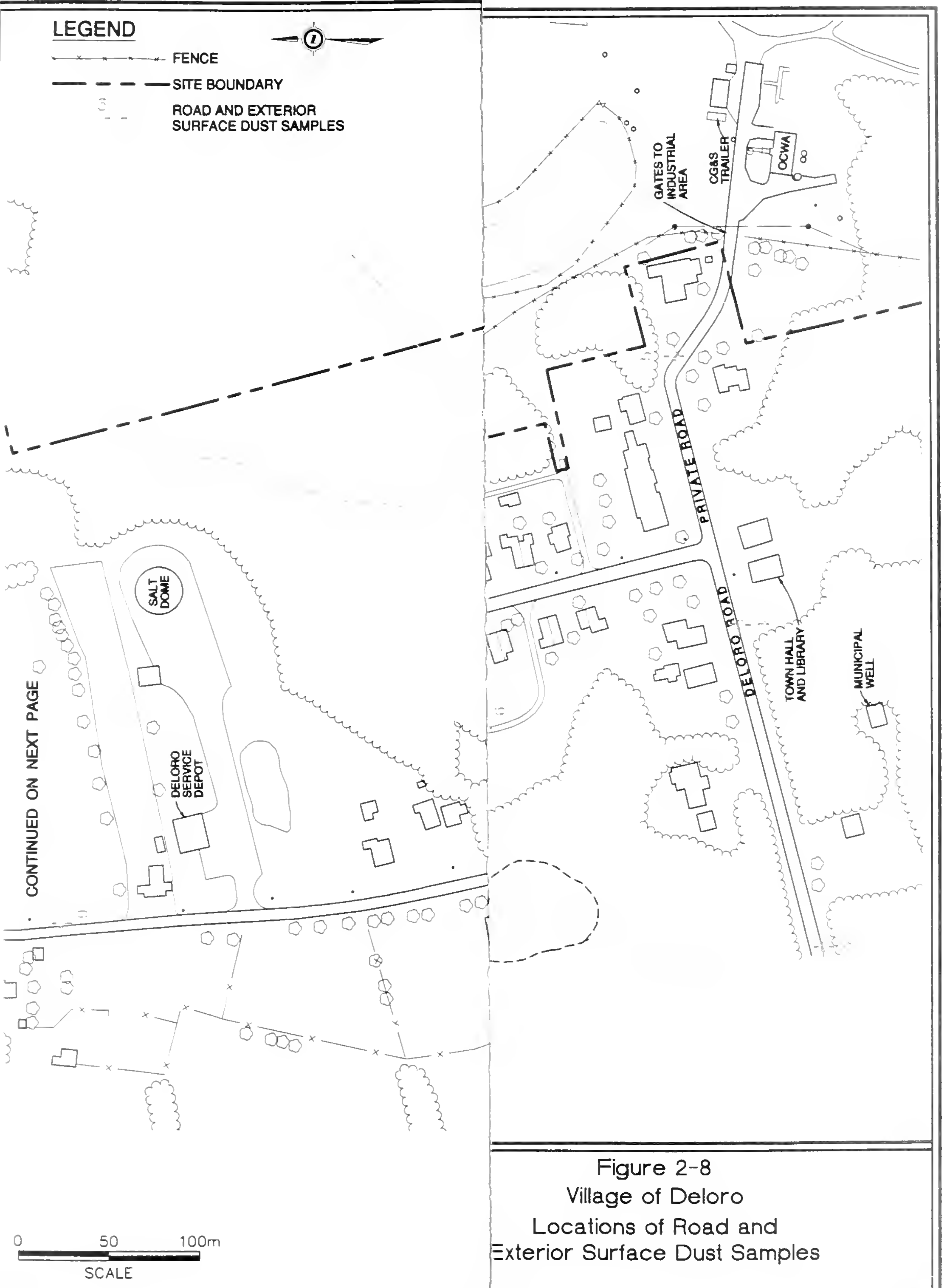

Figure 2-8
Village of Deloro
Locations of Road and
Exterior Surface Dust Samples

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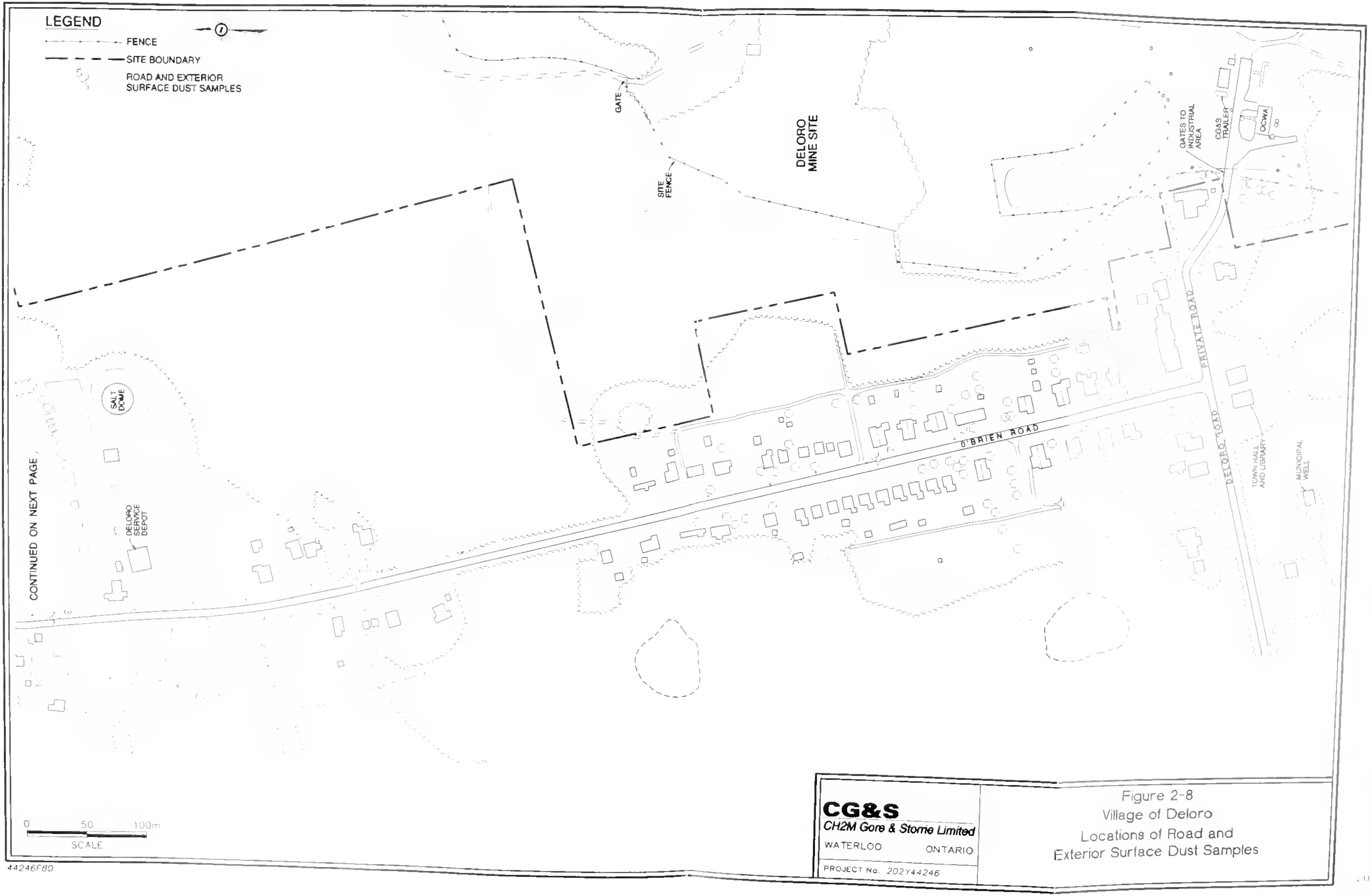

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Figure 2-8
Village of Deloro
Locations of Road and Exterior Surface Dust Samples

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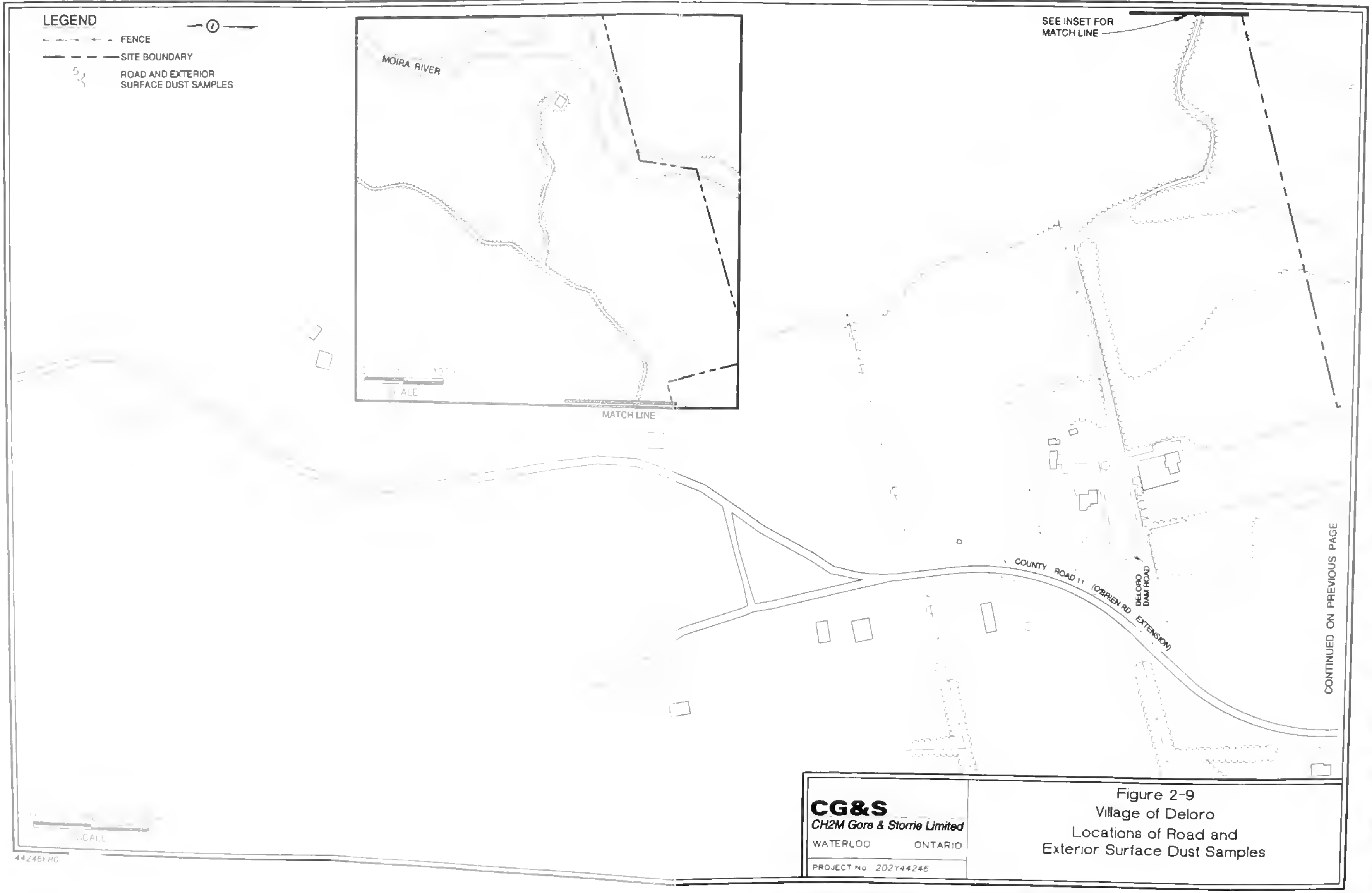

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Figure 2-9
Village of Deloro
Locations of Road and Exterior Surface Dust Samples

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Side-by-side duplicate samples were collected at each location. From each location, one sample was submitted to the participating laboratories for metals analyses while the other was submitted for radionuclide analyses. Chain-of-Custody records accompanied each shipment to the laboratory.

Table 2.5 summarizes the number of samples collected, QA/QC samples and the analyses performed.

TABLE 2.5
ANALYSES PERFORMED ON ROAD AND EXTERIOR SURFACE DUST SAMPLES

Sample Description	Number of Samples	Parameters Analyzed
Radionuclides		
Road dust	10	Ra-226, Th-230, Pb-210, Po-210
Exterior surface	10	Ra-226, Th-230, Pb-210, Po-210
Metals		
Road dust	10	Co, Ni, Ag, Pb, As, U
Exterior surface	10	Co, Ni, Ag, Pb, As, U
QA/QC		
Trip blank	1	Co, Ni, Ag, Pb, As, U
Lab duplicates	2	Co, Ni, Ag, Pb, As, U

Indoor Sampling

Sampling Locations

A total of 58 sampling locations were identified for the indoor air and dust sampling in the Village of Deloro (Figures 2-1 and 2-2). The sampling locations were comprised of 54 households, the Townhall/Library, the municipal well pumphouse, a youth centre in the Village of Deloro, and the Marmora Township office.

Sampling Methodology – Indoor Air

Two air sampling pumps were set up at each field sample location. The pumps were set to run at a flow rate of 3 litres per minute (LPM) for a period of approximately 28 hours. The sampling media used was a cartridge containing a mixed cellulose ester (MCE) filter with a 0.8-micron pore size. The pumps were set up on the main level near the common entranceway and in a common area where the occupants spent time while in the house, such as the living room or dining room. For households with children, one sample was acquired in the play area on the main floor of the dwelling. The pumps were calibrated in the field using a rotameter calibrated against a primary standard. For households with access restrictions, time restrictions, or electrical limitations, indoor pumps capable of sampling at 15 litres per minute were used.

Some samples were acquired using two to three filters when the initial filter became excessively loaded or if the sampling period could not be completed over a 28-hour period. Where two or three filters were used, the filters were submitted and analyzed as one sample. In consultation with the laboratory, it was determined that there was no impact on the analytical method or results by submitting more than one filter for analysis.

Sample information with respect to labelling, location, times, and flow rates was recorded onsite. No sample preservatives were used. Media were not touched by hand prior to submission to the laboratory. Trip blanks and field blanks were submitted for metals analysis as part of the QA/QC program. Chain-of-custody records accompanied each shipment to the laboratory.

Table 2.6 summarizes the number of samples collected, QA/QC samples and the analyses performed.

TABLE 2.6
ANALYSES PERFORMED ON INDOOR AIR SAMPLES

Sample Description	Number of Samples	Parameters Analzyed
Metals		
Indoor air	116	As, Co, U, Pb, Ni, Ag
QA/QC		
Trip blanks	2	As, Co, U, Pb, Ni, Ag
Field blanks	10	As, Co, U, Pb, Ni, Ag
Lab duplicates	8	As, Co, U, Pb, Ni, Ag

Sampling Methodology – Indoor Swipes

Two sample areas were identified at each location to determine surface dust on interior surfaces. At each sample area, duplicate swipe samples of a 100 cm^2 surface were acquired. The samples were collected by misting a 90-mm-diameter paper filter with 70 percent isopropyl alcohol and wiping a 100-cm^2 surface area until all the dust present was collected. The sample was folded in half and placed in a plastic bag. Duplicate samples were acquired at each location to allow parallel analyses for metals and radionuclides. The sample areas included horizontal surfaces on the top of appliances, buffets, hutches or entertainment centres. For households with children, one sample was acquired on the main level of the household in the children's play area.

Sample information with respect to labelling and location was recorded onsite. No sample preservatives were used. Hands were rinsed with 70 percent isopropyl alcohol and dried with a paper towel between sampling locations. Trip blank, field blanks, and sample duplicates were submitted as part of the QA/QC program for the indoor surface swipe samples. Duplicate samples were acquired at twelve sample locations (representing 6 households). The duplicate samples were acquired at a later date than the initial swipe sample. Chain-of-custody records accompanied each shipment to the laboratory.

Table 2.7 summarizes the number of samples collected, QA/QC samples and the analyses performed.

Sampling Methodology – Indoor Settled Dust

Two dust plates (140 mm by 15 mm petri dishes) were used to sample settled house dust. The dust plates were set in place, side by side, for a target period of 30 ± 2 days (actual sample periods ranged from 24 to 37 days). The sample location was selected to minimize impact to the occupants and the potential for disturbance by children or pets.

TABLE 2.7
ANALYSES PERFORMED ON INDOOR SWIPE SAMPLES

Sample Description	Number of Samples	Parameters Analyzed
Radionuclides		
Indoor swipes	116	Alpha and beta activity
Indoor dustfall – subset 15 households	30	Ra-226, Pb-210, Th-230, Po-210
QA/QC		
Trip blank	1	Ra-226, Pb-210, Th-230, Po-210, alpha and beta activity
Field blanks	2	Ra-226, Pb-210, Th-230, Po-210, alpha and beta activity
Metals		
Indoor swipes	116	As, Co, U, Pb, Ni, Ag
QA/QC		
Trip blanks	2	As, Co, U, Pb, Ni, Ag
Field blanks	10	As, Co, U, Pb, Ni, Ag
Sample duplicates (12 houses)	24	As, Co, U, Pb, Ni, Ag
Lab duplicates	8	As, Co, U, Pb, Ni, Ag

After the sampling period, the lids were placed on the sampling plates and sealed. Sample information with respect to labelling, location, and times was recorded onsite. No sample preservatives were used. Media were not touched by hand prior to submission to the laboratory. Duplicate samples were acquired to allow for parallel analyses of metals and radionuclides. Trip blanks and sample duplicates were submitted for analysis. Chain-of-custody records accompanied each shipment to the laboratory.

The actual diameter of the petri plate was 140 mm; therefore, the actual collection area was 154 cm^2. For comparative purposes, the indoor settled dust results have been corrected to reflect an exposure period of 30 days and a sampling area of 100 cm^2.

Table 2.8 summarizes the number of samples collected, QA/QC samples and the analyses performed.

TABLE 2.8
ANALYSES PERFORMED ON INDOOR DUSTFALL SAMPLES

Sample Description	Number of Samples	Parameters analyzed
Radionuclides		
Indoor dustfall	58	Alpha and beta activity
Indoor dustfall – subset 15 households	15	Ra-226, Pb-210, Th-230, Po-210
QA/QC		
Trip blanks	2	Ra-226, Pb-210, Th-230, Po-210, alpha and beta activity
Metals		
Indoor dustfall	58	As, Co, U, Pb, Ni, Ag
QA/QC		
Trip blanks	3	As, Co, U, Pb, Ni, Ag
Lab duplicates	4	As, Co, U, Pb, Ni, Ag

Sampling Methodology – Bulk Dust Samples

Three bulk dust samples were acquired using adhesive tape in each household. The samples were acquired where the settled dust plates were located for the 30-day period. Typically, this location was the top of the fridge in the kitchen or an elevated horizontal surface on the main level of the house. The samples are stored in plastic bags for possible future microscopic examination and analyses, if required. These samples were acquired for qualitative purposes and for reference locations purposes, thus no QA/QC samples were included in this protocol.

Groundwater Sampling

Sampling Locations

During the process of inviting residents to participate in the study, CG&S asked whether or not they used a private well for drinking water. Sampling of the in-use wells was a required component of the project. In addition to the private wells, the municipal well was tested for a subset of radionuclides which supplemented previous testing performed by the Ontario Clean Water Agency (OCWA). Figures 2-4 and 2-5 show the extent of the municipal well distribution system as well as the participating homes that use a private well for drinking water. The location of the municipal well is also shown.

Sampling Methodology – Drinking Water

One first draw and two flushed water samples were collected from each of 15 residences. The first draw samples were collected early in the morning before residents used their wells. Consequently, the first draw samples should be representative of an approximately eight-hour period of zero usage. Flushed water samples were obtained by running the water tap for a minimum of five minutes to flush the water system and ensure that fresh water samples were obtained.

Samples were obtained from an outside tap and hoses were removed where possible. The homes that had water treatment systems set their systems to by-pass during the sampling period to permit collection of untreated samples.

From each residence one first draw and one flushed sample were acidified with 1 percent nitric acid and were sent to CANVIRO for analyses for uranium and metals. One flushed sample from each residence was filtered (at 0.45 μm) and acidified with 1 percent nitric acid. The samples were sent to Becquerel for analyses for radionuclides.

Table 2.9 summarizes the number of samples collected, QA/QC samples and the analyses performed.

A flushed sample of untreated water was collected from the municipal well. The sample was collected from a sampling tap and was filtered (to 0.45 μm) and acidified with 1 percent nitric acid. The sample was submitted to Becquerel for analyses for radionuclides (Th-230, Pb-210, U-238, Th-232, Po-210) that were not part of the previous OCWA sampling program.

Well water samples were collected directly into pre-cleaned sample bottles provided by the laboratory. Samples were placed in coolers for transport. Chain-of–custody records accompanied each shipment to the laboratory.

TABLE 2.9
ANALYSES PERFORMED ON PRIVATE WELL DRINKING WATER SAMPLES

Sample Description	Number of Samples	Parameters Analyzed
Radionuclides		
Flushed sample	10	H-3, Sr-90, I-131, Cs-137, Ra-226, Pb-210, Po-210, Th-230, Th-232
Flushed sample	5	H-3, Sr-90, I-131, Cs-137, Ra-226, Pb-210, Po-210
QA/QC		
Trip blank	1	H-3, Sr-90, I-131, Cs-137, Ra-226, Pb-210, Po-210
Sample duplicate (flushed)	1	H-3, Sr-90, I-131, Cs-137, Ra-226, Pb-210, Po-210
Metals		
First draw sample	15	Co, Ni, Ag, Pb, As, U
Flushed sample	15	Co, Ni, Ag, Pb, As, U
QA/QC		
Sample duplicate (first draw)	1	Co, Ni, Ag, Pb, As, U
Trip blank	1	Co, Ni, Ag, Pb, As, U
Sample replicate (24-hour flushed)	1	Co, Ni, Ag, Pb, As, U

Analytical Procedures

Samples for metals analyses were submitted to CANVIRO Analytical Laboratories Ltd. Samples for radionuclide analyses were submitted to Becquerel Laboratories Inc. Details on laboratory analytical procedures are provided in Appendix C.

3. Discussion of Results

Reference Locations

Reference locations 1 and 2 should not be considered an indication of typical Ontario values. These locations should be considered to represent typical conditions at that particular location. There is no reason to expect that metal and radionuclide levels at these locations should necessarily be lower than those found within the study area, as the metals and radionuclides of concern are found within the natural environment, and may also originate from a number of anthropogenic sources. However, these reference locations do provide an indication of the variability of the results from the study area, and of typical levels that can be expected for this region. They can also provide bench-mark levels to indicate any large variances between the reference locations and the study area metal and radionuclide levels.

Regulatory Guidelines/Criteria

Air Quality Criteria

MOE Regulation 346 has published a set of guidelines known as the half-hour point of impingement (POI) limits for lead, arsenic, nickel, silver and cobalt (Table 3.1). MOE Regulation 337 established ambient outdoor air quality criteria (AAQC) for the same metals for a 24-hour period. The MOE has no published guidelines/criteria for radio-nuclides in air. Table 3.1 summarizes the available air quality criteria as defined under MOE Regulations 346 and 337.

TABLE 3.1
SUMMARY OF AVAILABLE AIR QUALITY CRITERIA

Type	Criteria	
	30-Minute (Ont. Reg. 346)	24-Hour (Ont. Reg. 337)
Lead	6 μg/m^3	2 μg/m^3 0.1 g/m^2/30 days (dustfall)
Arsenic	1 μg/m^3 150 ng/m^3 (1997 proposed value)	0.3 μg/m^3 50 ng/m^3 (1997 proposed value)
Nickel	5 μg/m^3 600 ng/m^3 (1997 proposed value)	2 μg/m^3 200 ng/m^3 (1997 proposed value)
Silver	3 μg/m^3	1 μg/m^3
Cobalt	0.3 μg/m^3	0.1 μg/m^3
Uranium	No criteria established	

The MOE's "Draft Rationale Document for the Development of Soil, Drinking Water, Surface Water, and Air Quality Criteria for Arsenic" (Standards Development Branch, February 1996), makes reference to a rural ambient level of arsenic in air. It states that the MOE Acidic Precipitation in Ontario Study (APIOS) has sampling stations in many rural areas, and indicates that the "ambient level" of arsenic in air in those areas is in the range of 0.001 to 0.002 $\mu g/m^3$.

Dust Criteria

Dustfall results are reported on a mass per area basis for metals and a radioactivity per area basis for radionuclides. Surface dust swipes are reported on a similar basis for metals and radionuclides. Since these results are reported on an area basis rather than a mass basis, the reported values are dependent on the amount of dust collected and the inherent variability in dust distribution and in sample collection.

The MOE has no guidelines/criteria for metals or radionuclides for indoor swipe or indoor settled dust samples. However, MOE Regulation 337 has established a standard for lead in exterior dustfall (Table 3.1).

Groundwater Criteria

Two sets of guidelines were used in this report for metals. These are the Ontario Drinking Water Objectives (ODWO; MOE, 1994) and the Guideline for Use at Contaminated Sites in Ontario (GUCS; MOE, 1997). Two sets of guidelines were used for radionuclides. These are the ODWO and Health Canada guidelines (Guidelines for Canadian Drinking Water Quality; Health Canada, 1998). Table 3.2 summarizes applicable criteria.

TABLE 3.2
CRITERIA APPLICABLE TO DRINKING WATER

Parameter	Metals		Radionuclides		
	ODWO (mg/L)	GUCS (mg/L)	Parameter	ODWO (Bq/L)	Health Canada (Bq/L)
Cobalt	–	0.1	Ra-226	1	0.6
Lead	0.01*	0.01	Pb-210	–	0.1
Nickel	–	0.1	Po-210	–	0.2
Silver	–	0.0012	Cs-137	50	10
Arsenic	0.025	0.025	I-131	10	6
Uranium	0.1	–	Sr-90	10	5
			H-3	7,000	7,000
			Th-230	–	0.4
			Th-232	–	0.1

Notes: Above ODWO concentrations include both MACs (maximum acceptable concentrations) and IMACs (interim maximum acceptable concentrations).
*Health Canada (1998) lead criteria 0.008 mg/L

Outdoor Air and Dust

Weather Station

The data recorded by the weather station is presented in Appendix D. A summary of the data for October 1998 is presented in Table 3.3.

TABLE 3.3
SUMMARY OF WEATHER DATA FOR OCTOBER 1998

	October 7 – 31, 1998	October Climate Normal
Daily mean temperature (°C)	9.1	8.6
Rainfall (mm)	26.4	72.2
Average wind speed (km/hr)	4.6	14
Dominant wind direction	N	SW

Meteorological monitoring was conducted from October 7, 1998 to November 10, 1998. The data were compared to historical data from Environment Canada (Canadian Climate Normals 1961 – 1990, Trenton). Based on this comparison, October 1998 was generally warmer, drier, less windy, and the wind had a different dominant direction. Given the small portion of November that was monitored, the data were not compared to historic data.

Outdoor Air

Outdoor air samples were acquired over a 24-hour sampling period, on ten sampling days at each of the ten outdoor sampling locations. A total of 98 outdoor air samples were acquired. Two samples were not acquired due to equipment malfunction. Descriptions of the locations are provided in Appendix B along with photo documentation.

Metals

The results of the metal analyses are provided in Appendix D and summarized in Table 3.4. Note that minimum and maximum concentrations are not equivalent when there are no detects because different air volumes were acquired at each pump. Therefore, the values are dependent on sample length. For sample results which were non-detect, a conservative method of using one-half of the reporting limit was used in all calculations.

TABLE 3.4
SUMMARY OF RESULTS FOR OUTDOOR AIR

Parameter	Units	Minimum Concentration[1]	Maximum Concentration[1]	Arithmetic Mean[1]	Number Exceeding Criteria (AAQC or POI Std.)	Number of Detects from 80 Samples
Metals						
Cobalt	µg/m³	0.00012[1]	0.00022[1]	0.00017	0	0
Lead	µg/m³	0.00083[1]	0.00040	0.0012	0	3
Nickel	µg/m³	0.000083[1]	0.00059	0.00021	0	35
Silver	µg/m³	0.00012[1]	0.00022[1]	0.00017	0	0
Arsenic	µg/m³	0.000042[1]	0.00045	0.00010	0	24
Uranium	µg/m³	0.00083[1]	0.0015[1]	0.0011	NA	0
Radionuclides						
Pb-210	Bq/m³	0.000007[1]	0.001989	0.000602	NA	79
Ra-226	Bq/m³	0.000003[1]	0.000048	0.000014	NA	57
Po-210*	Bq/m³	0.000062	0.000094	0.000078	NA	8*
Th-230*	Bq/m³	0.000012	0.000030	0.000019	NA	8*

Notes: All summary table values exclude reference location values and QA/QC values.
[1]50 percent of Reporting Limit used to calculate minimum, maximum, and mean for non-detect values
*Only eight samples taken (i.e. one day of sampling)
NA = Not applicable

No detectable levels of cobalt, silver, or uranium were found. Of the detectable levels measured for lead, nickel, and arsenic, none of the levels exceeded the current outdoor ambient air quality guidelines. The values measured for arsenic and nickel did not exceed the more stringent 1997 proposed values. The values measured for arsenic also did not exceed the Typical Rural Ambient Air range.

Two trip blanks and five field blanks were submitted as part of the QA/QC program for the outdoor air samples. With the exception of 0.5 μg of nickel found in one field blank, no detectable levels of the metals analyzed were found in the blank samples.

Radionuclides

The results of the radionuclide analyses are provided in Appendix D and summarized in Table 3.4.

Considerable ranges in results were found in the Radium-226 levels. However, since the calculated equivalent activity in the QA/QC blanks equalled or even exceeded these values, the Radium-226 values are believed to be below background levels. The apparent high level of activity in the blanks could be due to the composition of the filters.

Pb-210 values had an average daily range of 0.00079 – 0.00068 Bq/m^3. The calculated equivalent activity in the blanks was 0.00014 Bq/m^3 (this value was calculated based on a flow of 45 cfm for 24 hours). From these trends, it appears that the Pb-210 levels are above background levels.

For the sample day selected for additional radiological analyses (October 15-16, 1998), the results indicated no elevated levels of Ra-226 nor Pb-210 over the other sampling days. Both Th-230 and Po-210 had similar levels when compared to Ra-226 and Pb-210.

Comparison to Reference Location Levels

A summary comparison to the reference locations is provided in Table 3.5.

TABLE 3.5
COMPARISON TO REFERENCE LOCATIONS – OUTDOOR AIR

Parameter	Reference Location 1			Reference Location 2[nb]		
	Exceeds	Equal to	Less than	Exceeds	Equal to	Less than
Metals						
Cobalt	73	1	6	28	1	35
Lead	76	0	4	23	1	40
Nickel	56	0	24	36	1	27
Silver	74	0	6	32	1	31
Arsenic	63	0	17	31	1	32
Uranium	74	0	6	27	1	36
Radionuclides						
Pb-210	47	0	33	17	0	47
Ra-226	56	4	20	21	2	41
Po-210*	6	0	2	NA	NA	NA
Th-230*	8	0	0	NA	NA	NA

Notes: All summary table values exclude reference location values and QA/QC values.
*Only eight samples taken (i.e. one day of sampling)
nb = The pump was down at Reference Location 2 for two days out of 10
NA = Not applicable

Metal concentrations in outdoor air in the study area were generally higher than at Reference Location 1 and generally the same as at Reference Location 2.

Radionuclide concentrations in outdoor air in the study area were generally higher than at Reference Location 1 and lower than at Reference Location 2.

Road Dust

Since road dust concentrations are reported on a mass per area basis, reported values are in direct relation to the total amount of dust picked up by the swab. As a result, the presented levels are a qualitative representation of the outdoor dust in the study area.

All road surfaces were paved except for Location 6, which was a dirt path near the Deloro park. Consequently, the road dust metal and radionuclide levels are significantly higher at this location than other road dust locations. This location is not considered to be representative of road dust levels; therefore, it was removed from the summary tables below. Description of the locations are provided in Appendix B along with photo documentation.

The results of the road dust metal and radionuclide analyses are provided in Appendix D and summarized in Table 3.6.

TABLE 3.6
SUMMARY OF RESULTS FOR ROAD DUST

Parameter	Units	Minimum Level	Maximum Level	Arithmetic Mean[1]	Number Exceeding Criteria	Number of Detects from 7 Samples
Metals						
Cobalt	µg/100 cm^2	<0.75	6.0	2.10	NA	6
Lead	µg/100 cm^2	<5.0	11.0	7.30	NA	6
Nickel	µg/100 cm^2	1.8	19.0	10.51	NA	7
Silver	µg/100 cm^2	<0.75	<0.75	0.38	NA	0
Arsenic	µg/100 cm^2	0.38	16.0	4.90	NA	7
Uranium	µg/100 cm^2	<5.0	9.3	4.57	NA	3
Radionucludes						
Po-210	Bq/100 cm^2	0.020	0.060	0.044	NA	7
Pb-210	Bq/100 cm^2	<0.01	0.200	0.066	NA	4
Th-230	Bq/100 cm^2	<0.01	0.050	0.021	NA	6
Ra-226	Bq/100 cm^2	0.010	0.020	0.013	NA	7

Notes: All summary table values exclude reference location values and QA/QC values.
[1]50 percent of Reporting Limit used to calculate arithmetic mean for non-detect values
NA = Not applicable
Reporting limit will vary depending on air volume and dilution effects.

Metals

Silver was not detected in the samples at a reporting limit of 0.75 $\mu g/100\ cm^2$. All other metals were above reporting limits in at least one sample location. Location 6 had the highest cobalt, lead, nickel, silver, and uranium levels, as expected. Silver was not detected in this sample, indicating that silver may not be present at high concentrations in outdoor air. No criteria were available for comparison.

One trip blank was submitted for metals analysis with all road dust and exterior surface samples as part of the QA/QC program. No detectable levels of the metals analyzed were found in the trip blank. Two road dust lab duplicate samples were analyzed and had metal levels comparable to the original analysis.

Radionuclides

Radionuclides were detected above reporting limit; however, no trend was apparent. Location 6 had the highest Po-210 and Ra-226 levels corresponding to the large amount of dust picked up by the swab at this location.

Comparison to Reference Locations

A comparison of metal and radionuclide levels to levels at Reference Locations 1 and 2 is presented in Table 3.7.

TABLE 3.7
COMPARISON TO REFERENCE LOCATIONS – ROAD DUST

Parameter	Reference Location 1			Reference Location 2		
	Exceeds	Equal to	Less than	Exceeds	Equal to	Less than
Metals						
Cobalt	1	0	6	6	1	0
Lead	0	0	7	4	0	3
Nickel	3	0	4	4	0	3
Silver	0	7	0	0	7	0
Arsenic	6	0	1	6	0	1
Uranium	0	0	7	3	4	0
Radionuclides						
Pb-210	4	1	2	5	0	2
Ra-226	5	1	1	3	0	4
Po-210	3	3	1	3	0	4
Th-230	2	5	0	2	5	0

Metals levels at Reference Location 1 were generally less than or equal to metal levels in the study area samples with the exception of arsenic. Arsenic levels in study area samples exceeded the arsenic levels at Reference Location 1 in 6 of 7 samples. Metal levels at Reference Location 2 exceeded or equalled study area levels in almost all cases. As a result, Reference Location 2 would appear to have similar environmental conditions as those locations within the study area.

Radionuclide levels in the study area were generally higher than those found at Reference Locations 1 and 2.

Exterior Surface Dust

Exterior surface dust sampling locations included both horizontal and vertical surfaces; however, the data shows no evidence that one orientation is prone to more dust accumulation than the other. Descriptions of the exterior surface locations are provided in Appendix B along with photo documentation.

The results of the road dust metal and radionuclide analyses are provided in Appendix D and summarized in Table 3.8.

TABLE 3.8
SUMMARY OF RESULTS FOR EXTERIOR SURFACE DUST

Parameter	Units	Minimum Level	Maximum Level	Arithmetic Mean[1]	Number Exceeding Criteria	Number of Detects from 8 Samples
Metals						
Cobalt	µg/100 cm²	<0.75	4.8	1.34	NA	2
Lead	µg/100 cm²	<5.0	1,700	422.16	NA	7
Nickel	µg/100 cm²	<0.50	15	3.31	NA	5
Silver	µg/100 cm²	<0.75	<0.75	0.38	NA	0
Arsenic	µg/100 cm²	<0.25	83	12.31	NA	4
Uranium	µg/100 cm²	<5.0	<5.0	2.50	NA	0
Radionucludes						
Po-210	Bq/100 cm²	<0.01	1.650	0.601	NA	7
Pb-210	Bq/100 cm²	<0.01	3.600	1.178	NA	6
Th-230	Bq/100 cm²	<0.01	0.010	0.006	NA	0
Ra-226	Bq/100 cm²	<0.01	0.020	0.007	NA	1

Notes: All summary table values exclude reference location values and QA/QC values.
[1]50 percent of Reporting Limit used to calculate arithmetic mean for non-detect values
NA = Not applicable
Reporting limit will vary depending on dilution effects.

Metals

Silver and uranium were not detected at any sample locations. Cobalt was only detected at 3 locations, including Reference Location 2. The highest lead concentration (1,700 μg100 cm^2) was detected at exterior surface Location 6. This result likely reflects the fact that there is a gravel road and park near by.

No trip blanks were submitted for metals analysis with road dust and exterior surface samples as part of the QA/QC program. Two exterior surface lab duplicate samples were analyzed and had metal levels comparable to the original analysis.

Radionuclides

Po-210 and Pb-210 were detected at the majority of the locations while Th-230 was not detected at any location and Ra-226 was detected at just one location. The highest Po-210 and Pb-210 levels were found at Location 6 which is consistent with the highest total lead level detected there.

Comparison to Reference Locations

A comparison of metal and radionuclide levels to levels at Reference Locations 1 and 2 is presented in Table 3.9.

Metal levels found within the study area generally exceeded or equalled metal levels found at Reference Location 1. There is no apparent trend in metal levels found within the study area in comparison to Reference Location 2.

Radionuclide levels in the study area generally exceeded or equalled radionuclide levels found at Reference Location 1. There is no apparent trend in radionuclide levels found within the study area in comparison with Reference Location 2.

TABLE 3.9
COMPARISON TO REFERENCE LOCATIONS – EXTERIOR SURFACE DUST

Parameter	Reference Location 1			Reference Location 2		
	Exceeds	Equal to	Less than	Exceeds	Equal to	Less than
Metals						
Cobalt	2	6	0	2	0	6
Lead	7	0	1	1	0	7
Nickel	5	0	3	3	0	5
Silver	0	8	0	0	8	0
Arsenic	4	4	0	4	4	0
Uranium	0	8	0	0	8	0
Radionuclides						
Pb-210	4	0	4	4	0	4
Pb-210	7	1	0	5	0	3
Th-230	1	7	0	1	7	0
Ra-226	1	7	0	1	0	7

Outdoor Dustfall

Outdoor dustfall samples were each acquired over a 30-day sampling period. A total of 10 outdoor dust samples were collected. Descriptions of the locations are provided in Appendix B along with photo documentation.

Metals

The results of the outdoor dustfall metal analyses are provided in Appendix D and summarized in Table 3.10.

TABLE 3.10
SUMMARY OF RESULTS FOR OUTDOOR DUSTFALL RESULTS

Parameter	Units	Minimum Level[1]	Maximum Level[1]	Arithmetic Mean[1]	Number Exceeding Criteria	Number of Detects from 8 Samples
Metals						
Cobalt	µg/100 cm^2 /30 days	0.41[1]	2.19[1]	1.22[1]	NA	0
Lead	µg/100 cm^2 /30 days	2.74[1]	14.54[1]	8.13	0	0
Nickel	µg/100 cm^2 /30 days	0.27[1]	1.45[1]	0.81[1]	NA	0
Silver	µg/100 cm^2 /30 days	0.41[1]	2.19[1]	1.22[1]	NA	0
Arsenic	µg/100 cm^2 /30 days	0.14[1]	1/59	0.64[1]	NA	2
Uranium	µg/100 cm^2 /30 days	2.74[1]	14.54[1]	8.13[1]	NA	0
Radionucludes						
Po-210	Bq/100 cm^2 /30 days	0.005[1]	0.016	0.0103	NA	4
Pb-210	Bq/100 cm^2 /30 days	0.022[1]	0.055	0.033	NA	3
Th-230	Bq/100 cm^2 /30 days	0.011[1]	0.011[1]	0.011	NA	0
Ra-226	Bq/100 cm^2 /30 days	0.005[1]	0.005[1]	0.005	NA	0

Notes: All summary table values exclude reference location values and QA/QC values.
[1]50 percent of Reporting Limit used to calculate minimum, maximum, and mean for non-detect values
NA = Not applicable
Reporting limit will vary depending on number of days and dilution effects.

The outdoor dustfall samples contained debris that accumulated in the sampling containers. As a result, possible interferences resulted in increased method detection limits for the outdoor dust samples.

No detectable levels of cobalt, lead, nickel, silver, or uranium were measured in the outdoor settled dust samples. Of the ten outdoor sample locations, two locations contained detectable levels of arsenic (5.3 and 2.2 $\mu g/100\ cm^2$, respectively). Both of these sample locations were located adjacent to the Deloro Mine Site.

The values measured for lead did not exceed the lead dustfall criteria (Table 3.1).

The QA/QC samples included a blank wash of the sample transfer bags and a blank wash of the white sample collection media. No detectable levels of metals were found in the QA/QC samples for the outdoor dustfall.

Radionuclides

The results of the outdoor dustfall radionuclide analyses are provided in Appendix D and summarized in Table 3.10.

Neither Th-230 nor Ra-226 were detected in any of the outdoor dustfall samples. Five locations had positive readings for Po-210 and/or Pb-210. However, these readings were either at the method detection limit or slightly above the method detection limit.

Comparison to Reference Locations

A summary comparison to the reference locations is provided in Table 3.11.

TABLE 3.11
COMPARISON TO REFERENCE LOCATIONS – OUTDOOR DUSTFALL

Parameter	Reference Location 1			Reference Location 2		
	Exceeds	Equal to	Less than	Exceeds	Equal to	Less than
Metals						
Cobalt	5	0	3	5	0	3
Lead	5	0	3	5	0	3
Nickel	5	0	3	5	0	3
Silver	5	0	3	5	0	3
Arsenic	7	0	1	7	0	1
Uranium	5	0	3	5	0	3
Radionuclides						
Pb-210	4	4	0	4	4	0
Pb-210	3	5	0	3	5	0
Th-230	0	8	0	0	8	0
Ra-226	0	8	0	0	8	0

Metal and radionuclide levels in outdoor dustfall in the study area were generally similar to Reference Location 1 and Reference Location 2.

Indoor Air and Dust

Indoor Air

The indoor air samples were typically collected on one filter per sample location. However, some samples were acquired using two to three filters when the initial filter became excessively loaded or if the sampling period could not be completed over a 28-hour period. Where two or three filters were used, the filters were submitted and analyzed as one sample. In consultation with the laboratory it was determined that there was no impact on the analytical method or results by submitting more than one filter for analysis.

Metals

The results of the indoor air metal analyses are provided in Appendix D and summarized in Table 3.12. Two samples were taken at each location/household; therefore, the maximum and minimum concentration values are reported as household averages.

TABLE 3.12
SUMMARY OF RESULTS FOR INDOOR AIR

Parameter	Units	Minimum Concentration[1]	Maximum Concentration[1]	Arithmetic Mean[1]	Number Exceeding Criteria (AAQC or POI Std.)	Number of Detects from 56 Households*
Metals						
Cobalt	µg/m³	0.05[1]	0.09[1]	0.07	0	0
Lead	µg/m³	0.31[1]	0.57[1]	0.47	0	0
Nickel	µg/m³	0.03[1]	0.22	0.05	0	1
Silver	µg/m³	0.05[1]	0.09[1]	0.07	0	0
Arsenic	µg/m³	0.02[1]	0.03[1]	0.02	0	0
Uranium	µg/m³	0.31[1]	0.57[1]	0.47	NA	0

Notes: All summary table values exclude reference location values and QA/QC values.
[1]50 percent of Reporting Limit used to calculate minimum, maximum, and arithmetic mean for non-detect values
*Two samples were taken at each household: a detect means at least one of the two had a detect
NA = Not applicable
Reporting Limit will vary depending on air volume and dilution effects.

No detectable airborne levels of cobalt, lead, silver, arsenic or uranium were found. Of the 116 samples, one detectable level of airborne nickel (0.403 $\mu g/m^3$) was measured.

Due to limitations with acquiring a sufficient volume of air at some of the sample locations, some of the indoor airborne concentrations (based on the method detection limit for arsenic) were greater than the ambient air quality criteria. Nine (9) of the 116 samples were acquired with an insufficient air volume attributed to access limitations (2 of 9), equipment failure (4 of 9), or insufficient sampling time (3 of 9).

Two trip blanks and ten field blanks were submitted for metals analysis as part of the QA/QC program. No detectable levels of the metals analyzed were found in the trip or field blanks.

Comparison to Reference Locations

A summary comparison to the reference locations is provided in Table 3.13.

TABLE 3.13
COMPARISON TO REFERENCE LOCATIONS – OUTDOOR AIR

Parameter	Reference Location 1			Reference Location 2		
	Exceeds	Equal to	Less than	Exceeds	Equal to	Less than
Metals						
Cobalt	56	0	0	6	43	7
Lead	56	0	0	9	15	32
Nickel	56	0	0	2	45	9
Silver	56	0	0	6	43	7
Arsenic	56	0	0	5	51	0
Uranium	56	0	0	9	15	32

The metal concentrations in indoor air in the study area were higher than at Reference Location 1 in all samples and generally similar to, or less than, Reference Location 2.

Indoor Swipes

Metals

The results of the indoor swipe metal analyses are provided in Appendix D and summarized in Table 3.14. Two samples were taken at each location; therefore, the minimum and maximum concentration values are reported as household averages.

TABLE 3.14
SUMMARY OF RESULTS FOR EXTERIOR SURFACE DUST

Parameter	Units	Minimum Level	Maximum Level	Arithmetic Mean[1]	Number Exceeding Criteria	Number of Detects from 56 Households*
Metals						
Cobalt	μg/100 cm²	<0.75	1.09	0.42	NA	6
Lead	μg/100 cm²	<5.0	66.3	5.40	NA	13
Nickel	μg/100 cm²	<0.50	2.65	1.00	NA	52
Silver	μg/100 cm²	<0.75	2.04	0.40	NA	1
Arsenic	μg/100 cm²	<0.25	1.54	0.30	NA	15
Uranium	μg/100 cm²	<5.0	<5.0	2.50	NA	0
Radionuclides						
Po-210	Bq/100 cm²	<0.01	0.03	0.06	NA	2
Pb-210	Bq/100 cm²	<0.01	0.09	0.038	NA	11
Th-230	Bq/100 cm²	<0.01	<0.01	0.005	NA	0
Ra-226	Bq/100 cm²	<0.01	<0.01	0.005	NA	0
Alpha	Bq/100 cm²	<0.02	0.045	0.014	NA	17
Beta	Bq/100 cm²	<0.02	0.090	0.025	NA	19

Notes: All summary table values exclude reference location values and QA/QC values.
[1]50 percent of Reporting Limit used to calculate arithmetic mean for non-detect values
*Two swipes were taken at each household: a detect means at least one of the two had a detect
NA = Not applicable
Reporting limit will vary depending on dilution effects.

No detectable levels of uranium were found in any of the indoor surface swipe samples.

The upper level measured for lead was 130 μg/100 cm^2. The next highest level was 40 μg100 cm^2. Since there are potential indoor sources of lead (i.e. lead paint) further detailed testing of the bulk dust samples would be required to assist in determining the source of the lead.

Two trip blanks, ten field blanks, and twelve sample duplicates were submitted as part of the QA/QC program for the indoor surface swipe samples. No detectable levels of the metals analyzed were found in the trip or field blanks.

Side-by-side duplicate samples were acquired at twelve sample locations (representing six households). The duplicate samples were acquired at a later date than the initial swipe sample. For one sample, lead levels differed between the sample duplicates, specifically, not detected and 9.3 μg/100 cm^2. For two samples, the nickel levels differed between the sample duplicate, specifically, not detected and 0.61 μg/100 cm^2 and not detected and 0.61 μg/100 cm^2. The likeness in numbers is coincidental. These differences may be attributed to different household practices of storing household items on the top of the fridge.

Radionuclides

The results of the indoor swipe radionuclide analyses are provided in Appendix D and summarized in Table 3.14.

Of the 116 indoor swipe samples, 19 recorded gross alpha activity, the highest value of which was 0.06 Bq/100 cm^2. Sixty of the 116 samples recorded gross beta activity up to a maximum level of 0.17 Bq/100 cm^2.

One trip blank and two field blanks were submitted for gross alpha and gross beta analyses. One field blank indicated a positive gross beta level of 0.02 Bq/filter. No other detectable level of activity was measured in the blank samples.

Of the 15 household sub-sample analyses (two per household) for specific radionuclides, there was no detectable level of activity for Th-230, two detectable levels for Po-210, 24 detectable levels for Pb-210, and 1 detectable level for Ra-226. One trip blank and two field blanks were submitted for radionuclide analysis. Pb-210 was detected at 0.02 Bg/100 cm^2 in one of the field blank samples.

Comparison to Reference Locations

A summary comparison to the reference locations is provided in Table 3.15.

With the exception of nickel, the metal levels in indoor swipes in the study area were similar to Reference Location 1. Nickel levels were primarily higher in the study area samples than at Reference Location 1.The metal levels in study area samples were generally similar to, or greater than, at Reference Location 2.

The measurable levels of radionuclide activity for the two reference locations were generally greater than the comparable levels within the study area.

TABLE 3.15
COMPARISON TO REFERENCE LOCATIONS – INDOOR SWIPES

Parameter	Reference Location 1			Reference Location 2		
	Exceeds	Equal to	Less than	Exceeds	Equal to	Less than
Metals						
Cobalt	6	50	0	6	50	0
Lead	13	43	0	13	43	0
Nickel	51	0	5	34	0	22
Silver	1	55	0	1	55	0
Arsenic	15	41	0	15	41	0
Uranium	0	56	0	0	56	0
Radionuclides						
Po-210	0	1	12	2	12	0
Pb-210	0	0	13	0	0	13
Th-230	0	13	0	0	13	0
Ra-226	0	0	13	0	13	0
Alpha	17	39	0	17	39	0
Beta	14	7	35	26	5	25

Indoor Settled Dust

Metals

The results of the indoor settled dust metal analyses are provided in Appendix D and summarized in Table 3.16.

TABLE 3.16
SUMMARY OF RESULTS FOR INDOOR DUSTFALL

Parameter	Units	Minimum Level[1]	Maximum Level[1]	Arithmetic Mean[1]	Number Exceeding Criteria	Number of Detects from 56 Samples
Metals						
Cobalt	µg/100 cm^2 /30 days	0.20[1]	0.30	0.23	NA	0
Lead	µg/100 cm^2 /30 days	1.32	12.78	1.97	0	4
Nickel	µg/100 cm^2 /30 days	0.13	48.37	1.75	NA	15
Silver	µg/100 cm^2 /30 days	0.20[1]	0.30	0.23	NA	0
Arsenic	µg/100 cm^2 /30 days	0.07[1]	0.10	0.08	NA	0
Uranium	µg/100 cm^2 /30 days	1.32[1]	2.03	1.56	NA	0
Radionucludes						
Po-210	Bq/100 cm^2 /30 days	0.0003[1]	0.0018	0.0009	NA	0
Pb-210	Bq/100 cm^2 /30 days	0.0030	0.0708	0.0199	NA	6
Th-230	Bq/100 cm^2 /30 days	0.0003[1]	0.0019	0.0006	NA	0
Ra-226	Bq/100 cm^2 /30 days	0.0003[1]	0.0014	0.0007	NA	0
Alpha	Bq/100 cm^2 /30 days	0.005[1]	0.030	0.009	NA	21
Beta	Bq/100 cm^2 /30 days	0.005[1]	0.020	0.008	NA	16

Notes: All summary table values exclude reference location values and QA/QC values.
[1]50 percent of Reporting Limit used to calculate minimum, maximum, and arithmetic mean for non-detect values
NA = Not applicable
Reporting limit will vary depending on number of days and dilution effects.

No detectable levels of cobalt, silver, arsenic or uranium were found in the indoor settled dust samples. Detectable levels of lead, up to 13 $\mu g/100\ cm^2/30$ days, were found in four out of 58 sample locations and detectable levels of nickel, up to 48 $\mu g/100\ cm^2/30$ days, were found in 16 out of 58 samples.

For the nickel results, the next highest values were 26 $\mu g/100\ cm^2/30$ days, then 2.6 $\mu g/100\ cm^2/30$ days. For the lead results, the next highest values were 6.1 $\mu g/100\ cm^2/30$ days then 5.5 $\mu g/100\ cm^2/30$ days. Further analysis of the bulk dust samples can be conducted on these samples if potential sources are to be identified.

Three trip blanks were submitted for metals analysis. No detectable levels for the metals analyzed were found.

Radionuclides

The results of the indoor settled dust radionuclide analyses are provided in Appendix D and summarized in Table 3.16.

Of the 58 settled dust samples analyzed, 21 were positive for gross alpha, with a high of 0.019 $Bq/100\ cm^2/30$ days. Sixteen samples of 58 indicated gross beta activity, with the highest activity reading at 0.016 $Bq/100\ cm^2/30$ days. Two QA/QC trip blanks did not have any detectable level of gross alpha or beta activity.

Of the 15-household subsample, seven out of 15 had a detectable level of activity for Pb-210. No detectable levels of Po-210, Th-230, or Ra-226 were measured in the fifteen household subsamples.

The two trip blanks contained measurable levels of Pb-210 of which the highest activity level was greater than any of the sample results. No detectable levels of Po-210, Th-230, or Ra-226 were measured in the two trip blanks.

Comparison to Reference Locations

A summary comparison to the reference locations is provided in Table 3.17.

TABLE 3.17
COMPARISON TO REFERENCE LOCATIONS – INDOOR DUSTFALL

Parameter	Reference Location 1			Reference Location 2		
	Exceeds	Equal to	Less than	Exceeds	Equal to	Less than
Metals						
Cobalt	1	0	55	10	9	37
Lead	5	0	51	13	8	35
Nickel	16	0	40	3	0	53
Silver	1	0	55	10	9	37
Arsenic	1	0	55	10	9	37
Uranium	1	0	55	10	9	37
Radionuclides						
Po-210	0	0	13	3	5	5
Pb-210	6	0	7	4	0	9
Th-230	2	1	10	1	1	11
Ra-226	3	1	9	8	5	0
Alpha	23	0	33	23	33	0
Beta	21	0	35	21	35	0

Since the majority of the samples had non-detectable levels and the levels had to be corrected for a 30-day interval, the levels used in Tables 3.16 and 3.17 are largely dependent on the number of days that the collection dish was left in place. As a result, Reference Locations 1 and 2, which had relatively long collection periods when corrected, showed levels that were less than the majority of study area levels.

The measurable levels of radionuclide activity for the two reference locations were generally equal to or less than the comparable levels within the study area, although the total radioactivity was generally equal to or greater than the reference location levels.

Groundwater Samples

Private Wells

Residents who use a private well for drinking water answered a number of survey questions regarding the nature of their water supply systems. This information is provided in Appendix A. Fifteen households within the study area rely on a drilled well on their property for drinking water (see Figures 2-4 and 2-5).

Metals

The results of the private well water analyses are provided in Appendix D and summarized in Table 3.18.

Two locations had concentrations above the ODWO criteria for lead in first draw samples. Lead is commonly found in first draw samples, especially in older homes, and typically is a result of water piping containing lead alloys. It is because of this that Health Canada recommends flushing tap water prior to consumption. Lead concentrations at both locations fell below ODWO criteria in the flushed sample. No other metals concentrations in first draw or flushed water exceeded ODWO or GUCS guidelines.

One trip blank was submitted for all first draw and flushed water samples. No detectable levels of the metals analyzed were found in the trip blank. One first draw sample duplicate was analyzed and had metal levels comparable to the original analysis (all non-detect for both samples). One flushed sample replicate was taken 24 hours after the original sample. Analysis results showed that concentrations of the metals analyzed were comparable to the original sample (all non-detect in both samples). The sampling protocol was accurately followed for each sample obtained.

Radionuclides

Detailed radionuclide analyses were performed only on flushed water samples. The results of the flushed water radionuclide analyses is provided in Appendix D and summarized in Table 3.18.

The Pb-210 reporting limit was above the Health Canada guideline (0.1 Bq/L), however, Po-210, which is usually present at similar concentrations as Pb-210, had a lower reporting limit (0.01Bq/L). Po-210 was not detected and does not exceed guideline values. No other radionuclide concentrations exceeded guidelines.

TABLE 3.18
SUMMARY OF DRINKING WATER RESULTS FOR PRIVATE WELLS

Parameter	Units	Minimum Concentration	Maximum Concentration	Arithmetic Mean[1]	Number Exceeding Criteria (ODWO or Health Canada or GUCS)	Number of Detects from 15 Samples
First Draw Samples – Metals						
Cobalt	mg/L	<0.05	<0.05	0.025	0	0
Lead	mg/L	<0.0006	0.25	0.020	2	6
Nickel	mg/L	<0.01	0.01	0.0053	0	1
Silver	mg/L	<0.00005	0.00024	0.000047	0	2
Arsenic	mg/L	<0.005	<0.005	0.0025	0	0
Uranium	mg/L	<0.10	<0.10	0.050	0	0
Flushed Samples – Metals						
Cobalt	mg/L	<0.05	<0.05	0.025	0	0
Lead	mg/L	<0.0006	0.0068	0.00073	0	1
Nickel	mg/L	<0.01	<0.01	0.0050	0	0
Silver	mg/L	<0.00005	0.00012	0.000043	0	3
Arsenic	mg/L	<0.005	<0.005	0.0025	0	0
Uranium	mg/L	<0.10	<0.10	0.05	0	0
Flushed Samples – Radionuclides						
Ra-226	Bq/L	<0.01	0.02	0.0063	0	2
Pb-210	Bq/L	<0.5	<0.5	0.25	0	0
Po-210	Bq/L	<0.01	<0.01	0.005	0	0
Cs-137	Bq/L	<1	<1	0.50	0	0
I-131	Bq/L	<1	<1	0.50	0	0
Sr-90	Bq/L	<1	<1	0.50	0	0
H-3	Bq/L	<1,000	<1,000	500	0	0
Th-230	Bq/L	<0.01	0.01	0.006	0	2
Th-232	Bq/L	0.00204	0.00407	0.002	0	0

Notes: All summary table values exclude reference location values and QA/QC values.
[1]50 percent of Reporting Limit used to calculate arithmetic mean for non-detect values
NA = Not applicable

One trip blank was submitted for all private well and municipal well-flushed water samples. No detectable levels of the radionuclides analyzed were found in the trip blank. One sample duplicate was analyzed and had radionuclides levels comparable to the original analysis (all non-detect for both samples). The sampling protocol was accurately followed for each sample obtained.

Municipal Well

Metals

The municipal well water was sampled for metals in 1994 and 1998 by the Ontario Clean Water Agency at reporting limits below ODWO and GUCS criteria. Metal concentrations were below their respective criteria.

Radionuclides

The municipal well water was sampled in July and October of 1998 for radionuclides. The July sampling was done by the Ontario Clean Water Agency while October sampling was performed by CG&S.

Radionuclide concentrations for the samples collected by CG&S are provided in Appendix D. The Pb-210 reporting limit was above the Health Canada guideline (0.1 Bq/L), however, Po-210, which is usually present at similar concentrations as Pb-210, had a lower reporting limit (0.01Bq/L). Po-210 was not detected and does not exceed guideline values. No other radionuclide concentrations exceeded guidelines.

One trip blank was submitted for all private well and municipal well-flushed water samples. No detectable levels of the radionuclides analyzed were found in the trip blank. One sample duplicate was analyzed and had radionuclide levels comparable to the original analysis (all non-detect in both).

4. Summary and Conclusions

Based on the results of the Task II environmental sampling, the following summary and conclusions are presented for each sampling media.

Outdoor Air

- No detectable levels of cobalt, silver or uranium were found in the 98 samples analyzed. Of the detectable levels measured for lead, nickel, and arsenic, none of the levels exceeded the current outdoor ambient air quality guidelines. The values measured for arsenic and nickel did not exceed the more stringent 1997 proposed guideline values.
- Considerable ranges in results were found in the Radium-226 levels. However, since the calculated equivalent activity in the QA/QC blanks equalled or even exceeded these values, the Radium-226 values are believed to be below background levels. The apparent high level of activity in the blanks could be due to the composition of the filters.
- Pb-210 values had an average daily range of 0.00079 – 0.00068 Bq/m^3, which was higher than the calculated equivalent activity in the blank samples (0.00014 Bq/m^3). This suggests that the Pb-210 levels were above background levels. There are no ambient air quality guidelines for Pb-210.
- Metal concentrations in outdoor air in the study area were generally higher than at Reference Location 1 and generally the same as at Reference Location 2. Radionuclide concentrations in outdoor air in the study area were generally higher than at Reference Location 1 and lower than at Reference Location 2.

Road Dust

- Silver was not detected in the eight samples at a reporting limit of 0.75 $\mu g/100\ cm^2$. All other metals were above reporting limits in at least one sample location of the seven locations. Location 6 had the highest cobalt, lead, nickel, and uranium level, as expected because it was the only sampling location with an unpaved surface. Silver was not detected in this sample indicating that silver may not be present at high concentrations in outdoor air. No criteria were available for comparison.
- The radionuclides were detected above the reporting limit in at least one sample location. Location 6 had the highest Po-210 and Ra-226 levels corresponding to the large amount of dust picked up by the swab at this location.
- Metals levels at Reference Location 1 were generally less than or equal to metal levels in the study area samples with the exception of arsenic. Arsenic levels in study area samples exceeded the arsenic levels at Reference Location 1 in six of seven samples. Metal levels at Reference Location 2 exceeded or equalled study area levels in almost all cases. As a result, Reference Location 2 would appear to have similar environmental conditions as those locations within the study area.

- Radionuclide levels in the study area were generally higher than those found at Reference Locations 1 and 2.

Exterior Surface Dust

- Silver and uranium were not detected at any of the eight sample locations. Cobalt was only detected at 3 locations, including Reference Location 2. The highest lead concentration (1,700 μg100 cm^2) was detected at exterior surface Location 6. This result likely reflects the fact that there is a gravel road and park near by. No criteria exists for exterior surface dust.
- Po-210 and Pb-210 were detected at the majority of the locations while Th-230 was not detected at any location and Ra-226 was detected at just one location. The highest Po-210 and Pb-210 levels were found at Location 6, which is consistent with the highest total lead level detected there.
- Metal levels found within the study area generally exceeded or equalled metal levels found at Reference Location 1. Metal levels at Reference Location 2 show no apparent trend in comparison to metal levels found within the study area.
- Radionuclide levels in the study area generally exceeded or equalled radionuclide levels found at Reference Location 1. Radionuclide levels at Reference Location 2 show no apparent trend in comparison to levels found within the study area.

Outdoor Dustfall

- No detectable levels of cobalt, lead, nickel, silver, or uranium were measured in the outdoor settled dust samples. Of the ten outdoor sample locations, two locations contained detectable levels of arsenic (5.3 and 2.2 μg/100 cm^2, respectively). Both of these sample locations were located adjacent to the Deloro Mine Site. No criteria exists for the other parameters. The values measured for lead did not exceed the lead dustfall criteria.
- Neither Th-230 nor Ra-226 were detected in any of the outdoor dustfall samples. Five locations had positive readings for Po-210 and/or Pb-210. However, these readings were either at the method detection limit or slightly above the method detection limit.
- Metal and radionuclide levels in outdoor dustfall in the study area were generally similar to Reference Locations 1 and 2.

Indoor Air

- No detectable airborne levels of cobalt, lead, silver, arsenic or uranium were found. Of the 116 samples, one detectable level of airborne nickel (0.403 μg/m^3) was measured. This value does not exceed the outdoor air criteria used for nickel. There are no available criteria for indoor air.

- The metal concentrations in outdoor air in the study area were higher than at Reference Location 1 in all samples and generally similar to, or less than, Reference Location 2.

Indoor Swipes

- No detectable levels of uranium were found in any of the indoor surface swipe samples. The upper level measured for lead was 130 μg/100 cm^2. The next highest level was 40 μg/100 cm^2. Since there are potential indoor sources of lead (i.e. lead paint) further detailed testing of the bulk dust samples would be required to assist in determining the source of the lead.
- Of the 116 indoor swipe samples, 19 recorded gross alpha activity, the highest value of which was 0.06 Bq/100 cm^2. Sixty of the 116 samples recorded gross beta activity up to a maximum level of 0.17 Bq/100 cm^2.
- Of the 15-household subsample analyses (2 per household) for specific radionuclides, there was no detectable level of activity for Th-230, two detectable levels for Po-210, 24 detectable levels for Pb-210, and 1 detectable level for Ra-226.
- With the exception of nickel, the metal levels in indoor swipes in the study area were similar to Reference Location 1. Nickel levels were primarily higher in the study area samples than at Reference Location 1.The metal levels in study area samples were generally similar to, or greater than, at Reference Location 2.
- The measurable levels of radionuclide activity for the two reference locations were generally greater than the comparable levels within the study area.

Indoor Settled Dust

- No detectable levels of cobalt, silver, arsenic or uranium were found in the indoor settled dust samples. Detectable levels of lead, up to 13 μg/100 cm^2/30 days, were found in 4 out of 58 sample locations and detectable levels of nickel, up to 48 μg/100 cm^2/30 days, were found in 16 out of 58 samples.
- Of the 58 settled dust samples analyzed, 17 were positive for gross alpha, with a high of 0.019 Bq/100 cm^2/30 days. Fourteen samples of 58 indicated gross beta activity, with the highest activity reading at 0.016 Bq/100 cm^2/30 days.
- Of the 15 household subsample, 7 out of 15 had a detectable level of activity for Pb-210. No detectable levels of Po-210, Th-230, or Ra-226 were measured in the fifteen household subsamples.
- The metal concentrations in indoor dustfall in the study area were generally lower than at Reference Location 1 and Reference Location 2.
- The measurable levels of radionuclide activity for the two reference locations were generally equal to or less than the comparable levels within the study area.

Private Well Water

- Two locations had concentrations above the ODWO criteria for lead in first draw samples. Lead is commonly found in first draw samples, especially in older homes, and is a result of water piping containing lead alloys. Lead concentrations at both locations fell below ODWO criteria in the flushed sample. No other metals concentrations in first draw or flushed water exceeded ODWO or GUCS guidelines .
- None of the radionuclides analyzed exceeded their respective criteria in water.

Municipal Well Water

None of the metals or radionuclides analyzed exceeded their respective criteria in water.

5. References

Ontario Ministry of the Environment and Energy (rev 1994). "Ontario Drinking Water Objectives"

Ontario Ministry of the Environment and Energy (rev 1997). "Guidelines for Use at Contaminated Sites in Ontario"

Standards Development Branch, Ontario Ministry of the Environment and Energy (Feb. 1996). "Draft-Rationale Document for the Development of Soil, Drinking Water, Surface Water, and Air Quality Criteria for Arsenic"

Health Canada (1997). "Lead in Your Home"

Health Canada (1998). "The Health and Environment Handbook for Health Professionals"

Appendix A

CG&S Questionnaire Summary

House ID	c	by	bb	bf	bh	bi	bl	bm	bn	br
Street Name	Deloro	Deloro Dam	O'Brien	O'Brien	O'Brien	O'Brien	O'Brien	O'Brien	O'Brien	O'Brien
House Status	IN USE	IN USE	IN USE	IN USE	IN USE	IN USE	IN USE	IN USE	IN USE	IN USE
Indoor Participation?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Outdoor Participation?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
How many persons in household?	4 adults	1	2 adults, 2 children 7 bradon, 5	2 adults	2 adults	4 ADULTS	1	2 adults	1	4 - 2 adults, 2 children, boys 8&10
Uses a well?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
For what use?	drinking, edge of house	drink	drinking and wash	Drinking	drinking	drinking	drink	drinking/bathing	drink	drinking
Dug or drilled?	drilled	drilled	not sure	Drilled	drilled	drilled	drilled	drilled	drilled	drilled
Age of well?	~1970	22 yrs		>30		10 years approx	1973	27	1961	26
Depth of well?		95'		2 wells (110' and 60' to left)	65'	90'	90'	70'	68'	190'
Overburden or bedrock?		bedrock		Bedrock		bedrock	bedrock	bedrock	bedrock	bedrock
Type of pump (piston, jet, submersible)?	jet	submersible		Jet	jet	submersible		jet	submersible	
Lead pipes?										
Copper pipes with lead solder?	copper				copper					Copper
Threaded galvanized steel?										
Cast iron/PVC?				PVC	ABS	PVC	PVC	PVC	PVC - last january	
Is there any water treatment (if so, what)?	N	N	N	N	N		N	N	N	N
Does outside tap go through treatment?		N	N	N	Y				N	

House ID	bs	bt	bu	bv	bw
Street Name	O'Brien	O'Brien	O'Brien	O'Brien	O'Brien
House Status	IN USE	IN USE	IN USE	IN USE	IN USE
Indoor Participation?	Y	Y	Y	Y	Y
Outdoor Participation?	Y	Y	Y	Y	Y
How many persons in household?	3 adults	2 adults	4 - 2 adults, 2 children - boys 13, 11	3 adults	4 - 2 adults, 2 children - boy 11, girl 16
Uses a well?	Y	Y	Y	Y	Y
For what use?	drinking	drink	drinking	drinking, bathing, etc	drinking
Dug or drilled?	drilled	drilled	drilled	drilled	drilled
Age of well?		>20 yrs			>1970
Depth of well?	80+	93'	not sure		~50'
Overburden or bedrock?	overburden	bedrock			
Type of pump (piston, jet, submersible)?	pump in house	jet in basement			
Lead pipes?					
Copper pipes with lead solder?	Copper				
Threaded galvanized steel?					
Cast iron/PVC?	PVC	PVC			
Is there any water treatment (if so, what)?	filter (White styrofoam insert - caleric	N	softener		N
Does outside tap go through treatment?	Y		Y		Y behind house

APPENDIX B

LOCATION DESCRIPTIONS AND PHOTO DOCUMENTATION

Photo 1: Road Dust Sampling Location #1
Marmora – Hwy #7

Photo 2: Exterior Surface Sampling Location #1
Marmora – front of falling rock sign

Photo 3: Road Dust Sampling Location #2
Deloro – Country Road 11 into Deloro at junction of Station Rd. and Deloro Rd.

Photo 4: Exterior Surface Sampling Location #2
– front of yellow sign at junction of Station Rd. and Deloro Rd.

Photo 5: Road Dust Sampling Location #3
Deloro – before Town of Deloro on Deloro Rd.

Photo 6: Exterior Surface Sampling Location #3
Deloro – back of 50 km/hr sign before Town of Deloro on Deloro Rd.

Photo 9: Road Dust Sampling Location #5
Deloro – just west of Deloro Mine Site, on curve of private road before entrance gate

Photo 10: Exterior Surface Sampling Location #5
Deloro – just west of Deloro Mine Site, back of the Miner's Loop sign

Photo 7: Road Dust Sampling Location #4
Deloro – near town community centre

Photo 8: Exterior Surface Sampling Location #4
Deloro – back of Quiet Zone sign near community centre

Photo 11: Road Dust Sampling Location #6
West of Deloro – gravel road, west of main street near playing field

Photo 12: Exterior Surface Sampling Location #6
Deloro – near playing fields, back side of metal shed behind houses on main street

Photo 13: Road Dust Sampling Location #7
Deloro – main street, near mailboxes

Photo 14: Exterior Surface Sampling Location #7
Deloro – main street, top of mail boxes

Photo 15: Road Dust Sampling Location #8
Deloro – north edge of town on main street

Photo 16: Exterior of Surface Sampling Location #8
Deloro – Topside of mailbox at north edge of town on main street

Photo 17: Road Dust Sampling Location #9
North of Deloro

Photo 18: Exterior Surface Sampling Location #9
North of Deloro – front of 50 km/h sign

Photo 19: Road Dust Sampling Location #10
North of Deloro

Photo 20: Exterior Surface Sampling Location #10
North of Deloro – front side of Cattle Crossing sign

Photo 21: Weather Station - CG&S site trailer

Photo 22: Weather Station - CG&S site trailer

Photo 23: Outdoor Hi-vol Air and Dustfall Location #1

Photo 24: Outdoor Hi-vol Air and Dustfall Location #1

Photo 25: Outdoor Hi-vol Air and Dustfall Location #1

Photo 26: Outdoor Hi-vol Air and Dustfall Location #2

Photo 27: Outdoor Hi-vol Air and Dustfall Location #2

Photo 28: Outdoor Hi-vol Air and Dustfall Location #2

Photo 29: Outdoor Hi-vol Air and Dustfall Location #2

Photo 30: Outdoor Hi-vol Air and Dustfall Location #3

Photo 31: Outdoor Hi-vol Air and Dustfall Location #4

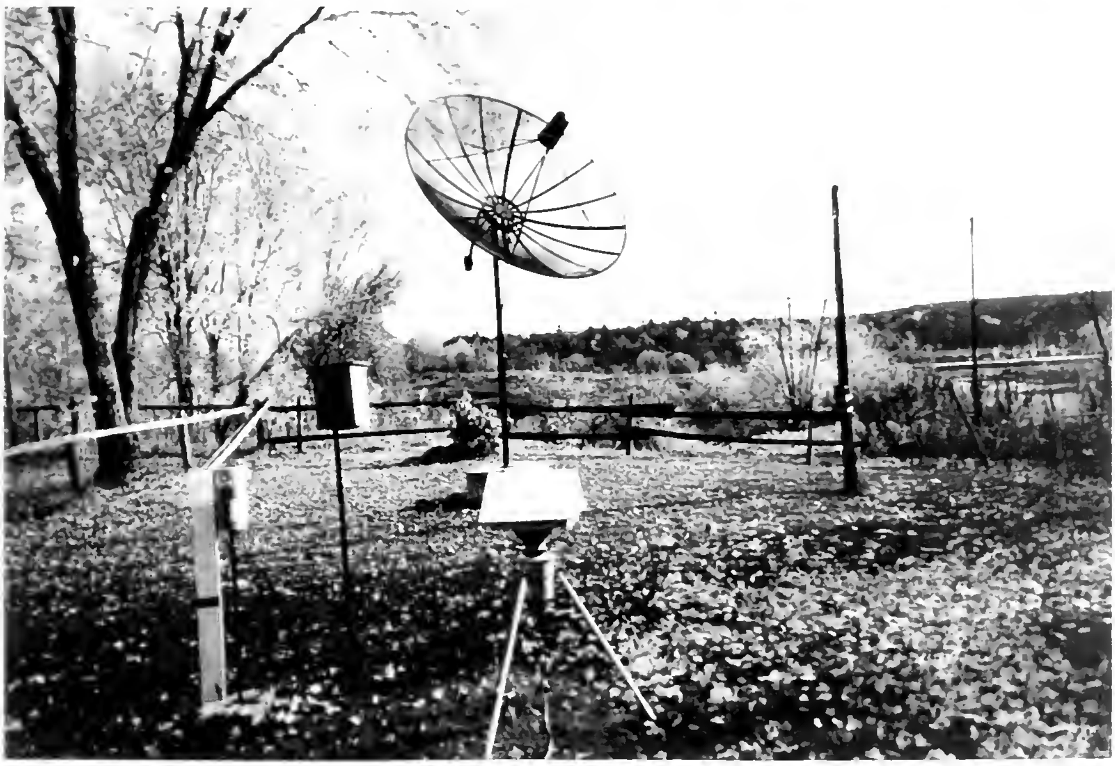

Photo 32: Outdoor Hi-vol Air and Dustfall Location #5

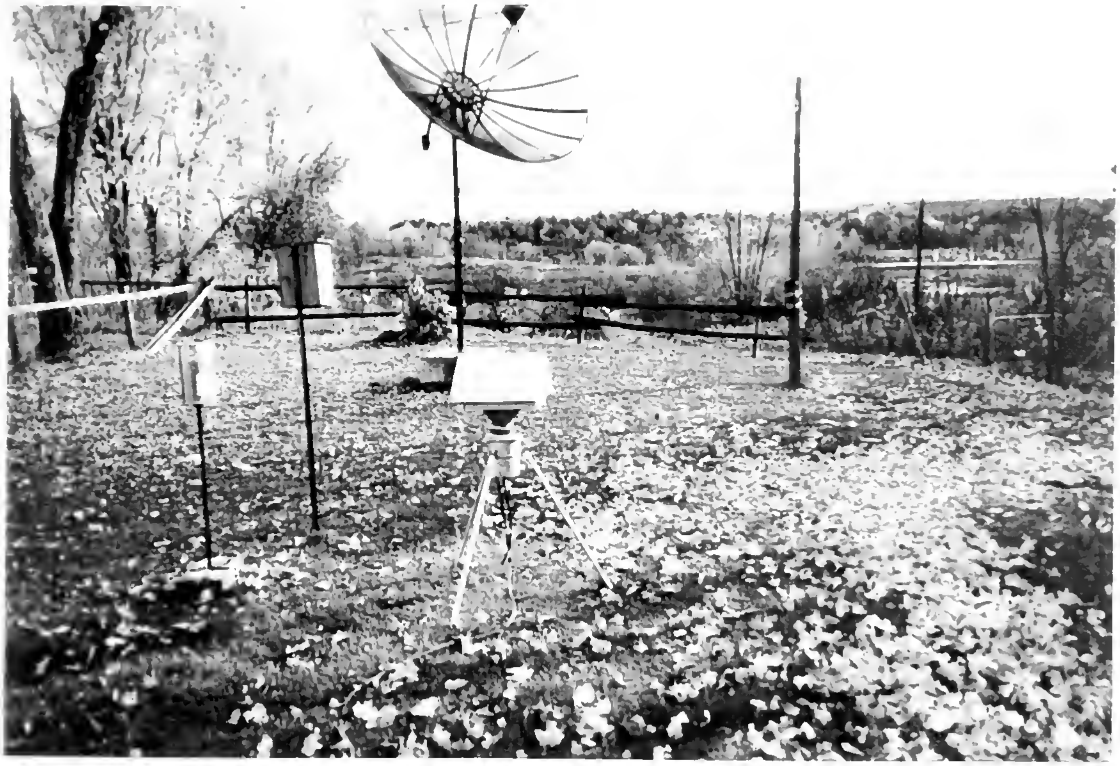

Photo 33: Outdoor Hi-vol Air and Dustfall Location #5

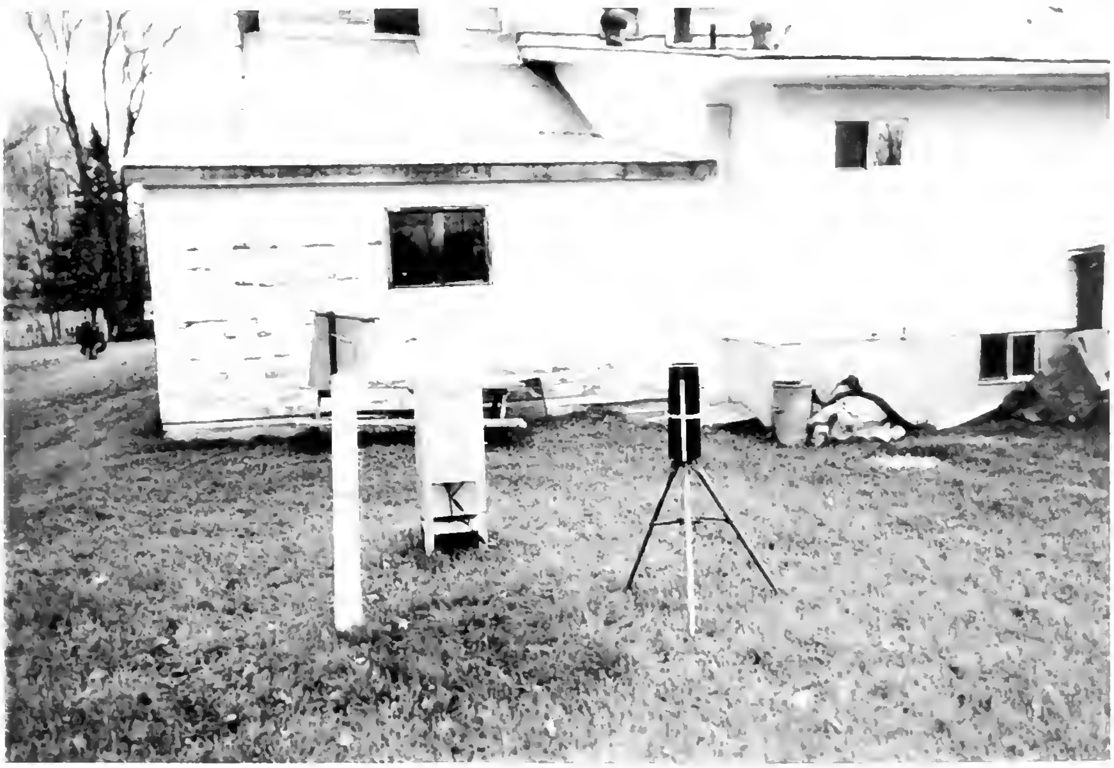

Photo 34: Outdoor Hi-vol Air and Dustfall Location #6

Photo 35: Outdoor Hi-vol Air and Dustfall Location #6

Photo 36: Outdoor Hi-vol Air and Dustfall Location #7

Photo 37: Outdoor Hi-vol Air and Dustfall Location #7

Photo 38: Outdoor Hi-vol Air and Dustfall Location #8

Photo 39: Outdoor Hi-vol Air and Dustfall Location #9

Photo 40: Outdoor Hi-vol Air and Dustfall Location #10

Photo 41: Outdoor Hi-vol Air and Dustfall Location #10

Photo 42: Outdoor Hi-vol Air and Dustfall Location #10

APPENDIX C

LABORATORY PROCEDURES

Methodology for the Analysis of Metals Analytes

Canviro Laboratories

Groundwater Analysis

Metals (GFAA) for Lead, Silver - EPA SW846-7421 / 7761

Samples are vigorously digested in Nitric Acid followed by Hydrochloric Acid, brought up to the final volume with dilute Nitric Acid and filtered if required. The digestate is analysed by Graphite Furnace Atomic Absorption (GFAA) at specified wavelengths.

Metals (ICAP) for Nickel, Cobalt, Uranium- EPA SW846-6010

Samples are vigorously digested in Nitric Acid followed by Hydrochloric Acid, brought up to the final volume with dilute Nitric Acid and filtered if required. The digestate is analysed by Inductively Coupled Argon Plasma (ICAP) at specified wavelengths.

Metals (Hydride) for Arsenic - EPA 7061

Samples are vigorously digested in Nitric Acid followed by Hydrochloric Acid, brought up to the final volume with dilute Nitric Acid. An aliquot of sample is put through an additional digestion with Hydrochloric Acid and the aliquot is filtered if required. The digestate is analysed by Hydride generation Inductively Coupled Argon Plasma (ICAP) at specified wavelengths.

Filter/Swab/Dustfall Analysis

Metals (ICAP) for Lead, Silver, Nickel, Cobalt, Uranium- EPA SW846-6010

Samples are vigorously digested in Nitric Acid followed by addition of Peroxide solution and Hydrochloric Acid, brought up to the final volume with milli-Q water and filtered if required. The digestate is analysed by Inductively Coupled Argon Plasma (ICAP) at specified wavelengths.

Metals (Hydride) for Arsenic - EPA 7061

Samples are vigorously digested in Nitric Acid followed by addition of Peroxide solution and Hydrochloric Acid, brought up to the final volume with milli-Q water. An aliquot of sample is put through an additional digestion with Hydrochloric Acid and the aliquot is filtered if required. The digestate is analysed by Hydride generation Inductively Coupled Argon Plasma (ICAP) at specified wavelengths.

"EPA" refers to methods set by the Environmental Protection Agency.

Methodology for the Analysis Of Radionuclide Analytes

Sample Processing and Preparation

Indoor Wipes

The indoor wipes were transferred to glass beakers and tracers and carriers were added. The filter papers were destroyed by digesting with concentrated nitric acid. Near the end of the digestion, hydrogen peroxide was added to destroy any remaining organic matter. This solution was evaporated to dryness and then dissolved with 25 ml of 8M nitric acid and tracers and carriers were then added.

Indoor Dustfall

A paper filter was wet with methanol and the interior of the receptacles were wiped. This was then placed on the alpha/beta counter. For the samples that required additional analysis, the filters were transferred to glass beakers and tracers and carriers were added. The filter papers were destroyed by digesting with concentrated nitric acid. Near the end of the digestion, hydrogen peroxide was added to destroy any remaining organic matter. This solution was evaporated to dryness and then dissolved by warming with 25 ml of 8M nitric acid. Tracers and carriers were then added.

Outdoor Wipes

The road and exterior dust wipes were transferred to glass beakers and the glass bottles were rinsed out with dilute nitric acid. The wipes were destroyed by digesting with concentrated nitric acid. Near the end of the digestion, hydrogen peroxide was added to destroy additional remaining organic matter. This digestate was transferred to teflon beakers. A mixture of hydrofluoric, nitric and hydrochloric acid was added. The solutions were evaporated to dryness and then dissolved with 25 ml of 8M nitric acid plus some boric acid and tracers and carriers were then added.

Outdoor Dustfall

The samples were screened through a 1 mm. screen to remove any large particles. The entire filtrate was then digested with nitric acid and taken to dryness. The residue was dissolved with 25 ml. of 8M nitric acid.

Air Filters

The air filters were cut into strips and transferred to teflon beakers. A mixture of hydrofluoric nitric and hydrochloric acid was added and the papers were digested. Near the end of the digestion, hydrogen peroxide (and additional nitric acid, if necessary) was added to destroy any remaining organic matter. This solution was evaporated to dryness. The

residue was dissolved using 25 ml of 8M nitric acid plus some boric acid and warming. Tracers and carriers were then added.

Water Samples

No preliminary digestion was required for these samples.

Separation and Measurement of Radionuclides

Gross Alpha & Beta Radioactivities

The samples were placed directly into the gas flow proportional counter and counted for a fixed period of time. The alpha and beta net count rates were converted to activities and reported.

Polonium-210

The Polonium-210 was separated from the solutions by collection on silver foil. The Polonium-210 was determined by alpha spectrometry.

Lead-210

The Lead-210 was separated using anion exchange and then sulfide precipitation with copper as a carrier. The precipitate was collected on a filter and a stored for a period of ten days to allow the grow-in of Bi-210. This was measured by gas-flow proportional counting and the Lead-210 was computed.

Thorium-230

The Thorium-230 was separated from the solution using anion exchange. This was eluted from the column and precipitated using cerium fluoride. This was collected on a membrane filter and the Thorium-230 was measured using alpha-spectrometry.

Radium-226

The Radium-226 was precipitated from the solution using lead sulphate as a carrier. This was dissolved and a second precipitation with barium provided a clean separation. The precipitate was collected on a filter and the Radium-226 was measured using alpha-spectrometry. (This procedure is based on EPA Method 903.0)

Total Uranium & Thorium

An aliquot of the solution is evaporated to dryness at low temperature. The residue is placed in a nuclear reactor for a short irradiation. Gamma spectroscopy is then used to determine the total uranium content.

Cesium-137 and Iodine-131

High resolution gamma-ray spectrometry is applied directly to 500ml. of liquid contained in Marinelli beakers. The spectrum is collected and the concentration of the individual

radionuclides is calculated. (This procedure is based on EPA Method 901.1) For samples of limited volume, the sample is evaporated and the solids are counted on a planchet.

Tritium

Tritium is measured by liquid scintillation counting. An appropriate aliquot is mixed with scintillation solution, dark adapted and then counted for tritium beta particle activity. (This procedure is based on EPA Method 906.0)

Strontium-90

The strontium-90 is measured by precipitating the yttrium-90 daughter of strontium-90 as the hydroxide using stable yttrium and ferric ion as carriers and stable strontium ion as a holdback carrier. The hydroxide is then collected on a filter for beta counting. (This procedure is based on EPA Method 905.0)

APPENDIX D

WEATHER STATION AND ANALYTICAL DATA

Appendix D.1 Summary of the Meteorological Data - October 1998

Day	Temp. Daily Mean (°C)	Temp. Daily High (°C)	Time	Temp. Daily Low (°C)	Time	Rain (mm)	Wind Avg. Speed (kmh)	Wind Max. High (kmh)	Time	Wind Dom. Direction
1										
2	-									
3										
4										
5										
6										
7	15.4	22.0	5:51a	12.7	11:46p	5.6	3.2	25.7	10:46p	SW
8	11.0	14.0	12:16p	5.4	10:16p	6.6	5.3	30.6	12:16p	NE
9	9.7	18.6	4:46p	3.8	7:46a	0.0	6.7	24.1	9:46a	ENE
10	11.3	20.4	5:30p	5.9	12:00m	0.0	4.1	19.3	11:30a	NE
11	12.1	20.7	5:30p	5.8	12:30a	0.0	7.8	29.0	2:00p	NE
12	10.6	20.9	3:30p	4.4	7:30a	0.0	2.7	19.3	1:00p	ENE
13	12.6	21.3	3:00p	6.6	1:30a	1.5	3.6	32.2	12:30p	SW
14	8.2	16.4	2:00p	3.8	8:00a	1.0	1.6	19.3	2:00p	N
15	7.9	18.2	5:00p	3.4	11:30p	0.0	4.4	22.5	4.30a	N
16	3.2	12.1	12:30p	0.1	6:00a	0.0	1.0	9.7	9:00a	E
17	13.1	15.6	1:25p	10.1	11:55p	0.0	2.6	20.9	5:25p	SW
18	14.3	21.1	12:55p	7.6	7:25a	1.0	6.7	40.2	3:25p	SW
19	10.6	15.7	2:00p	6.5	8:30p	0.0	6.8	38.6	1:25a	NW
20	8.0	14.8	3:30p	0.6	12:00m	0.0	5.5	37.0	4:00p	N
21	3.8	11.6	3:30p	-1.4	4:30a	0.0	5.5	38.6	12:00p	N
22	5.9	12.7	5.30p	1.6	12:00m	0.0	6.8	29.0	11:30a	N
23	7.8	20.1	4.30p	-1.9	5:00a	0.0	4.2	33.8	2:30p	WNW
24	11.7	22.7	4:30p	4.5	1:00a	0.0	4.5	30.6	2:00p	W
25	7.3	14.2	2:00p	3.1	5:00a	0.0	1.5	16.1	11:30a	E
26	7.3	13.5	2:00p	4.1	3:30a	1.3	3.7	20.9	2:30p	ESE
27	9.8	20.2	3:00p	4.8	8:30a	0.0	3.5	25.7	3.00p	SW
28	11.6	17.8	5:00p	5.9	1:30a	9.4	7.1	33.8	10:30p	SW
29	6.5	14.8	5:00p	-0.1	12:00m	0.0	6.8	29.0	2:30a	NE
30	2.8	13.2	5:00p	-3.6	8:00a	0.0	4.4	25.7	12:00p	NNE
31	4.5	15.8	4:30p	-1.8	8:30a	0.0	4.1	22.5	12:00p	NNE
Month Summary	**9.1**	**22.7**	--	**-3.6**	--	**26.4**	**4.6**	**40.2**	--	**N**

Climate Normals*	Temp. Daily Mean (°C)	Temp. Daily Max. (°C)		Daily Min. (°C)		Rain (mm)	Wind Speed (kmh)	Wind Max Hourly Speed (kmh)		Most Frequent Direction
October	**8.6**	**13.8**	--	**3.4**	--	**72.2**	**14**	**72**	--	**SW**

The project start date for monitoring weather was October 7, 1998. Month Summary data is based on the data acquired between October 7 - 31, 1998. The Climate Normals Data is acquired from Environment Canada. Canadian Climate Normals 1961- 1990.

Appendix D.1 Summary of the Meteorological Data - November 1998										
Day	Temp. Daily Mean (°C)	Temp. Daily High (°C)	Time	Temp. Daily Low (°C)	Time	Rain (mm)	Wind Avg Speed (kmh)	Wind Max. High (kmh)	Time	Wind Dom. Direction
1	5.4	12.9	4:00p	-1.1	3:30a	0.0	8.3	35.4	8:30p	NNE
2	3.6	8.0	2:00p	0.4	11:30p	0.0	11.5	38.6	10:30a	NNE
3	1.6	9.1	5:00p	-4.3	12:00m	0.0	6.6	32.2	1:30p	N
4	-0.5	7.5	4:30p	-6.4	4:00a	0.0	4.2	29.0	2:00p	N
5	1.2	7.2	2:00p	-2.9	12:30a	0.0	4.1	30.6	12:00p	NNE
6	1.6	4.7	1:30p	-0.2	6:00a	0.0	1.2	12.9	2:00p	N
7	3.2	8.7	3:30p	0.8	8:00a	0.5	3.3	24.1	2:30p	NNE
8	2.7	5.2	3:00p	-2.2	12:00m	0.0	2.2	16.1	11:00a	N
9	2.4	6.3	1:00p	-2.4	12:30a	0.4	0.4	14.5	1:00p	SSE
10	3.4	6.3	12:00p	0.3	3:00a	2.3	3.5	32.2	1:00p	SE
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										
Month Summary	**2.5**	**12.9**	--	**-6.4**	--	**4.3**	**4.5**	**38.6**	--	**N**
Climate Normals*	Temp. Daily Mean (°C)	Temp. Daily Max. (°C)		Daily Min. (°C)		Rain (mm)	Wind Speed (kmh)	Wind Max Hourly Speed (kmh)		Most Frequent Direction
November	**2.8**	**7.0**	--	**-1.4**	--	**82.0**	**16**	**74**	--	**SW**

The project completion date for monitoring weather was November 10, 1998. Month Summary data is based on the data acquired between november 1 - 10, 1998. The Climate Normals Data is acquired from Environment Canada, Canadian Climate Normals 1961- 1990.

Meteorological Summary

The following table summarizes the weather data for October, 1998.

	October 7 - 31, 1998	Climate Normal
Daily Mean Temp. (°C)	9.1	8.6
Rainfall (mm)	26.4	72.2
Average Wind Speed (kmh)	4.6	14
Dominant Wind Direction	N	SW

Meteorological monitoring was conducted from October 7, 1998 - November 10, 1998. When comparing the data for October with historical data from Environment Canada, Canadian Climate Normals, 1961 - 1990, it can be sumarized that Ocober, 1998 was warmer, drier, less windy, and that the wind had a different dominant wind direction. Given the small portion of November that was monitored, it is not meaningful to comment on the November data or compare them to historic data.

Appendix D.2: Outdoor Air Analyzed for Metals

Zone	Study ID	Location Number	Sample Date	San	Arsenic ug/filter	Air Conc. ug/m3	Uranium ug/filter	Air Conc. ug/m3
	RL				0.25		5	
1		10	Oct 8-9/98	4:30pm Oct 8 - 5	<	5.93E-05	<	1.19E-03
2		9		4:20pm Oct 8 - 5	<	6.47E-05	<	1.29E-03
2		8		4:10pm Oct 8 - 4	<	5.07E-05	<	1.01E-03
3		7		3:30pm Oct 8 - 4	<	5.37E-05	<	1.07E-03
3		6		2:35pm Oct 8 - 4	0.43	1.99E-04	<	1.15E-03
3		5		2:30pm Oct 8 - 4	<	5.44E-05	<	1.09E-03
3		4		2:15pm Oct 8 - 4	0.41	1.36E-04	<	8.29E-04
4		3		5:00pm Oct 8 - 5	0.27	1.09E-04	<	1.01E-03
Daily Calculations								
min					0.125	5.07E-05	2.5	8.29E-04
max					0.43	1.99E-04	2.5	1.29E-03
median					0.125	6.20E-05	2.5	1.08E-03
mean					0.217	9.07E-05	2.5	1.08E-03
standard deviation					0.135	5.34E-05	0	1.39E-04
Reference								
		2		2:00pm Oct 8 - 4	<	5.70E-05	<	1.14E-03
		1		6:00pm Oct. 8 - 8	0.31	1.02E-04	<	8.26E-04
1		10	Oct 13-14/98	9:45am Oct 13 -	0.40	1.97E-04	<	1.23E-03
2		9		9:40am Oct. 13 -	<	6.76E-05	<	1.35E-03
2		8		9:35am Oct. 13 -	0.34	1.49E-04	<	1.09E-03
3		7		9:30am Oct. 13 -	<	5.66E-05	<	1.13E-03
3		6		9:25am Oct. 13 -	0.47	2.40E-04	<	1.28E-03
3		5		9:20am Oct. 13 -	0.46	2.11E-04	<	1.15E-03
3		4		8:55am Oct 13 -	0.89	3.24E-04	<	9.09E-04
4		3		9:00am Oct 13 -	0.41	1.67E-04	<	1.02E-03
Daily Calculations								
min					0.125	5.66E-05	2.5	9.09E-04
max					0.89	3.24E-04	2.5	1.35E-03
median					0.405	1.82E-04	2.5	1.14E-03
mean					0.403	1.76E-04	2.5	1.15E-03
standard deviation					0.240	8.82E-05	0	1.42E-04
Reference								
		2		8:50am Oct. 13 -	0.39	1.86E-04	<	1.19E-03
		1		8:00am Oct. 13 -	0.36	1.27E-04	<	8.83E-04

Appendix D.2: Outdoor Air Analyzed for Metals

Zone	Study ID RL	Location Number	Sample Date	Sample Time	Sample Period (min)	Volume of air (m3)	Cobalt ug/filter 0 75	Air Conc. ug/m3	Lead ug/filter 5	Air Conc. ug/m3	Nickel ug/filter 0 5	Air Conc. ug/m3	Silver ug/filter 0 75	Air Conc. ug/m3	Arsenic ug/filter 0 25	Air Conc. ug/m3	Uranium ug/filter 5	Air Conc. ug/m3
1		10	Oct 8-9/98	4 30pm Oct 8 - 5 05 Oct 9	1475	2108	<	1 78E-04	<	1 19E-03	0 68	3 23E-04	<	1 78E-04	<	5 93E-05	<	1 19E-03
2		9		4 20pm Oct 8 - 5 00 Oct 9	1480	1931	<	1 94E-04	<	1 29E-03	0 82	4 25E-04	<	1 94E-04	<	6 47E-05	<	1 29E-03
2		8		4 10pm Oct 8 - 4 55 Oct 9	1485	2463	<	1 52E-04	<	1 01E-03	<	1 01E-04	<	1 52E-04	<	5 07E-05	<	1 01E-03
3		7		3 30pm Oct 8 - 4 50 Oct 9	1520	2326	<	1 61E-04	<	1 07E-03	0 97	4 17E-04	<	1 61E-04	<	5 37E-05	<	1 07E-03
3		6		2 35pm Oct 8 - 4 45 Oct 9	1570	2166	<	1 73E-04	<	1 15E-03	<	1 15E-04	<	1 73E-04	0 43	1 99E-04	<	1 15E-03
3		5		2 30pm Oct 8 - 4 43 Oct 9	1603	2298	<	1 63E-04	<	1 09E-03	0 60	2 61E-04	<	1 63E-04	<	5 44E-05	<	1 09E-03
3		4		2 15pm Oct 8 - 4 40 Oct 9	1585	3016	<	1 24E-04	<	8 29E-04	<	8 29E-05	<	1 24E-04	0 41	1 36E-04	<	8 29E-04
4		3		5 00pm Oct 8 - 5 08 Oct 9	1448	2486	<	1 51E-04	<	1 01E-03	0 80	3 22E-04	<	1 51E-04	0 27	1 09E-04	<	1 01E-03
Daily Calculations																		
min							0 375	1 24E-04	2 5	8 29E-04	0 25	8 29E-05	0 375	1 24E-04	0 125	5 07E-05	2 5	8 29E-04
max							0 375	1 94E-04	2 5	1 29E-03	0 97	4 25E-04	0 375	1 94E-04	0 43	1 99E-04	2 5	1 29E-03
median							0 375	1 62E-04	2 5	1 08E-03	0 64	2 91E-04	0 375	1 62E-04	0 125	6 20E-05	2 5	1 08E-03
mean							0 375	1 62E-04	2 5	1 08E-03	0 578	2 56E-04	0 375	1 62E-04	0 217	9 07E-05	2 5	1 08E-03
standard deviation							0	2 09E-05	0	1 39E-04	0 292	1 40E-04	0	2 09E-05	0 135	5 34E-05	0	1 39E-04
Reference																		
		2		2 00pm Oct 8 - 4 30 Oct 9	1590	2192	<	1 71E-04	<	1 14E-03	0 56	2 55E-04	<	1 71E-04	<	5 70E-05	<	1 14E-03
		1		6 00pm Oct 8 - 8 00pm Oct 9	1560	3025	<	1 24E-04	<	8 26E-04	0 60	1 98E-04	<	1 24E-04	0 31	1 02E-04	<	8 26E-04
1		10	Oct 13-14/98	9 45am Oct 13 - 9 50am Oct 14	1445	2027	<	1 85E-04	8 2	4 04E-03	1 1	5 43E-04	<	1 85E-04	0 40	1 97E-04	<	1 23E-03
2		9		9 40am Oct 13 - 9 45am Oct 14	1445	1850	<	2 03E-04	<	1 35E-03	1 1	5 94E-04	<	2 03E-04	<	6 76E-05	<	1 35E-03
2		8		9 35am Oct 13 - 9 30am Oct 14	1435	2288	<	1 64E-04	<	1 09E-03	0 56	2 45E-04	<	1 64E-04	0 34	1 49E-04	<	1 09E-03
3		7		9 30am Oct 13 - 9 25am Oct 14	1435	2208	<	1 70E-04	<	1 13E-03	0 81	3 67E-04	<	1 70E-04	<	5 66E-05	<	1 13E-03
3		6		9 25am Oct 13 - 9 20am Oct 14	1435	1959	<	1 91E-04	<	1 28E-03	0 72	3 67E-04	<	1 91E-04	0 47	2 40E-04	<	1 28E-03
3		5		9 20am Oct 13 - 9 15am Oct 14	1435	2181	<	1 72E-04	<	1 15E-03	1 1	5 04E-04	<	1 72E-04	0 46	2 11E-04	<	1 15E-03
3		4		8 55am Oct 13 - 9 00am Oct 14	1445	2750	<	1 36E-04	<	9 09E-04	0 40	1 45E-04	<	1 36E-04	0 89	3 24E-04	<	9 09E-04
4		3		9 00am Oct 13 - 9 10am Oct 14	1450	2452	<	1 53E-04	<	1 02E-03	0 82	3 34E-04	<	1 53E-04	0 41	1 67E-04	<	1 02E-03
Daily Calculations																		
min							0 375	1 36E-04	2 5	9 09E-04	0 4	1 45E-04	0 375	1 36E-04	0 125	5 66E-05	2 5	9 09E-04
max							0 375	2 03E-04	8 2	4 04E-03	1 1	5 94E-04	0 375	2 03E-04	0 89	3 24E-04	2 5	1 35E-03
median							0 375	1 71E-04	2 5	1 14E-03	0 815	3 67E-04	0 375	1 71E-04	0 405	1 82E-04	2 5	1 14E-03
mean							0 375	1 72E-04	3 213	1 50E-03	0 826	3 88E-04	0 375	1 72E-04	0 403	1 76E-04	2 5	1 15E-03
standard deviation							0	2 13E-05	2 015	1 04E-03	0 264	1 53E-04	0	2 13E-05	0 240	8 82E-05	0	1 42E-04
Reference																		
		2		8 50am Oct 13 - 8 54am Oct 14	1444	2093	<	1 79E-04	<	1 19E-03	1 0	4 78E-04	<	1 79E-04	0 39	1 86E-04	<	1 19E-03
		1		8 00am Oct 13 - 8 20am Oct 14	1460	2831	<	1 32E-04	<	8 83E-04	1 0	3 53E-04	<	1 32E-04	0 36	1 27E-04	<	8 83E-04

Zone	Study ID RL	Location Number	Sample Date	Sample Time	Sample Period (min)	Volume of air (m3)	Cobalt ug/filter 0 75	Air Conc. ug/m3	Lead ug/filter 5	Air Conc. ug/m3	Nickel ug/filter 0 5	Air Conc. ug/m3	Silver ug/filter 0 75	Air Conc. ug/m3	Arsenic ug/filter 0 25	Air Conc. ug/m3	Uranium ug/filter 5	Air Conc. ug/m3
1		10	Oct 14-15/98	9 50am Oct 14 - 9 30am Oct 15	1420	2116	<	1 77E-04	<	1 18E-03	0 72	3 40E-04	<	1 77E-04	<	5 91E-05	<	1 18E-03
2		9		9 45am Oct 14 - 9 25am Oct 15	1420	1966	<	1 91E-04	<	1 27E-03	<	1 27E-04	<	1 91E-04	<	6 36E-05	<	1 27E-03
2		8		9 30am Oct 14 - 9 15am Oct 15	1425	2318	<	1 62E-04	<	1 08E-03	0 81	3 49E-04	<	1 62E-04	<	5 39E-05	<	1 08E-03
3		7		9 40am Oct 14 - 9 20am Oct 15	1420	2173	<	1 73E-04	<	1 15E-03	<	1 15E-04	<	1 73E-04	<	5 75E-05	<	1 15E-03
3		6		9 25am Oct 14 - 9 05am Oct 15	1420	1969	<	1 90E-04	<	1 27E-03	<	1 27E-04	<	1 90E-04	<	6 35E-05	<	1 27E-03
3		5		9 18am Oct 14 - 9 00am Oct 15	1422	2088	<	1 80E-04	<	1 20E-03	0 56	2 68E-04	<	1 80E-04	<	5 99E-05	<	1 20E-03
3		4		9 03am Oct 14 - 8 50am Oct 15	1423	2783	<	1 35E-04	<	8 98E-04	0 92	3 31E-04	<	1 35E-04	<	4 49E-05	<	8 98E-04
4		3		9 15am Oct 14 - 8 55am Oct 15	1420	2401	<	1 56E-04	<	1 04E-03	<	1 04E-04	<	1 56E-04	<	5 21E-05	<	1 04E-03
	Daily Calculations																	
	min						0 375	1 35E-04	2 5	8 98E-04	0 25	1 04E-04	0 375	1 35E-04	0 125	4 49E-05	2 5	8 98E-04
	max						0 375	1 91E-04	2 5	1 27E-03	0 92	3 49E-04	0 375	1 91E-04	0 125	6 36E-05	2 5	1 27E-03
	median						0 375	1 75E-04	2 5	1 17E-03	0 405	1 98E-04	0 375	1 75E-04	0 125	5 83E-05	2 5	1 17E-03
	mean						0 375	1 70E-04	2 5	1 14E-03	0 50125	2 20E-04	0 375	1 70E-04	0 125	5 68E-05	2 5	1 14E-03
	standard deviation						0	1 89E-05	0	1 26E-04	0 286478	1 12E-04	0	1 89E-05	0	6 30E-06	0	1 26E-04
	Reference																	
		2		8 54am Oct 14 - 8 35am Oct 15	1421	2100	<	1 79E-04	<	1 19E-03	<	1 19E-04	<	1 79E-04	<	5 95E-05	<	1 19E-03
		1		8 20am Oct 14 - 7 40am Oct 15	1400	2715	<	1 38E-04	<	9 21E-04	<	9 21E-05	<	1 38E-04	<	4 60E-05	<	9 21E-04
1		10	Oct 15-16/98	9 35am Oct 15 - 11 35am Oct 16	1560	2243	<	1 67E-04	<	1 11E-03	<	1 11E-04	<	1 67E-04	<	5 57E-05	<	1 11E-03
2		9		9 25am Oct 15 - 11 20am Oct 16	1555	2090	<	1 79E-04	<	1 20E-03	<	1 20E-04	<	1 79E-04	<	5 98E-05	<	1 20E-03
2		8		9 15am Oct 15 - 11 13am Oct 16	1558	2584	<	1 45E-04	<	9 67E-04	<	9 67E-05	<	1 45E-04	<	4 84E-05	<	9 67E-04
3		7		9 20am Oct 15 - 11 05am Oct 16	1545	2390	<	1 57E-04	<	1 05E-03	0 5	2 09E-04	<	1 57E-04	<	5 23E-05	<	1 05E-03
3		6		9 05am Oct 15 - 11 00am Oct 16	1555	2190	<	1 71E-04	<	1 14E-03	<	1 14E-04	<	1 71E-04	<	5 71E-05	<	1 14E-03
3		5		9 00am Oct 15 - 10 53am Oct 16	1553	2307	<	1 63E-04	<	1 08E-03	<	1 08E-04	<	1 63E-04	<	5 42E-05	<	1 08E-03
3		4		8 50am Oct 15 - 9 05am Oct 16	1455	2948	<	1 27E-04	<	8 48E-04	<	8 48E-05	<	1 27E-04	<	4 24E-05	<	8 48E-04
4		3		8 55am Oct 15 - 10 45am Oct 16	1550	2661	<	1 41E-04	<	9 39E-04	<	9 39E-05	<	1 41E-04	<	4 70E-05	<	9 39E-04
	Daily Calculations																	
	min						0 375	1 27E-04	2 5	8 48E-04	0 25	8 48E-05	0 375	1 27E-04	0 125	4 24E-05	2 5	8 48E-04
	max						0 375	1 79E-04	2 5	1 20E-03	0 5	2 09E-04	0 375	1 79E-04	0 125	5 98E-05	2 5	1 20E-03
	median						0 375	1 60E-04	2 5	1 06E-03	0 25	1 10E-04	0 375	1 60E-04	0 125	5 32E-05	2 5	1 06E-03
	mean						0 375	1 56E-04	2 5	1 04E-03	0 281	1 17E-04	0 375	1 56E-04	0 125	5 21E-05	2 5	1 04E-03
	standard deviation						0	1 74E-05	0	1 16E-04	0 088	3 89E-05	0	1 74E-05	0	5 80E-06	0	1 16E-04
	Reference																	
		2		pump down			—		-		--		--		--		—	
		1		7 45am Oct 15 - 7 45am Oct 16	1440	2819	<	1 33E-04	<	8 87E-04	<	8 87E-05	<	1 33E-04	<	4 43E-05	<	8 87E-04
1		10	Oct 16-17/98	11 35am Oct 16 - 11 50am Oct 17	1455	2041	<	1 84E-04	<	1 22E-03	0 67	3 28E-04	<	1 84E-04	0 26	1 27E-04	<	1 22E-03
2		9		11 20am Oct 16 - 11 45am Oct 17	1465	1899	<	1 97E-04	<	1 32E-03	0 79	4 16E-04	<	1 97E-04	0 39	2 05E-04	<	1 32E-03
2		8		11 13am Oct 16 - 11 40am Oct 17	1467	2422	<	1 55E-04	<	1 03E-03	0 94	3 88E-04	<	1 55E-04	0 81	3 34E-04	<	1 03E-03
3		7		11 05am Oct 16 11 35am Oct 17	1470	2274	<	1 65E-04	<	1 10E-03	0 75	3 30E-04	<	1 65E-04	0 54	2 37E-04	<	1 10E-03
3		6		11 00am Oct 16 - 11 25am Oct 17	1470	2049	<	1 83E-04	<	1 22E-03	0 64	3 12E-04	<	1 83E-04	0 50	2 44E-04	<	1 22E-03
3		5		10 53am Oct 16 - 11 25am Oct 17	1472	2237	<	1 68E-04	<	1 12E-03	0 60	2 68E-04	<	1 68E-04	0 59	2 64E-04	<	1 12E-03
3		4		9 05am Oct 16 - 9 35am Oct 17	1470	2901	<	1 29E-04	8 0	2 76E-03	0 55	1 90E-04	<	1 29E-04	0 60	2 07E-04	<	8 62E-04
4		3		10 45am Oct 16 - 11 15am Oct 17	1470	2460	<	1 52E-04	<	1 02E-03	<	1 02E-04	<	1 52E-04	0 48	1 95E-04	<	1 02E-03
	Daily Calculations																	
	min						0 375	1 29E-04	2 5	1 02E-03	0 25	1 02E-04	0 375	1 29E-04	0 26	1 27E-04	2 5	8 62E-04
	max						0 375	1 97E-04	8	2 76E-03	0 94	4 16E-04	0 375	1 97E-04	0 81	3 34E-04	2 5	1 32E-03
	median						0 375	1 66E-04	2 5	1 17E-03	0 655	3 20E-04	0 375	1 66E-04	0 52	2 22E-04	2 5	1 11E-03
	mean						0 375	1 67E-04	3 1875	1 35E-03	0 64875	2 92E-04	0 375	1 67E-04	0 52125	2 27E-04	2 5	1 11E-03
	standard deviation						0	2 15E-05	1 944544	5 79E-04	0 202374	1 04E-04	0	2 15E-05	0 16137246	5 99E-05	0	1 44E-04
	Reference																	
		2		pump down			-				--		--		--		--	
		1		7 45am Oct 16 - 7 50am Oct 17	1445	2828	<	1 33E-04	<	8 84E-04	<	8 84E-05	<	1 33E-04	0 40	1 41E-04	<	8 84E-04

Zone	Study ID	Location Number	Sample Date	San	Arsenic ug/filter	Air Conc. ug/m3	Uranium ug/filter	Air Conc. ug/m3
	RL				0.25		5	
1		10	Oct 19-20/98	12:55pm Oct 19	<	5.86E-05	<	1.17E-03
2		9		12:50pm Oct. 19	<	6.55E-05	<	1.31E-03
2		8		12:45pm Oct. 19	<	5.05E-05	<	1.01E-03
3		7		12:40pm Oct. 19	0.31	1.33E-04	<	1.08E-03
3		6		12:35pm Oct. 19	<	6.02E-05	<	1.20E-03
3		5		12:30pm Oct 19	0.28	1.29E-04	<	1.15E-03
3		4		12:10pm Oct 19	<	4.37E-05	<	8.74E-04
4		3		12:15pm Oct 19	<	5.07E-05	<	1.01E-03
Daily Calculations								
min					0.125	4.37E-05	2.5	8.74E-04
max					0.31	1.33E-04	2.5	1.31E-03
median					0.125	5.94E-05	2.5	1.11E-03
mean					0.168	7.39E-05	2.5	1.10E-03
standard deviation					0.079	3.59E-05	0	1.36E-04
Reference								
		2		12:05pm Oct 19	<	5.49E-05	<	1.10E-03
		1		11:40am Oct. 19	<	4.34E-05	<	8.67E-04
1		10	Oct 20-21/98	2:05pm Oct. 20 -	<	6.20E-05	<	1.24E-03
2		9		2:00pm Oct 20 -	<	6.71E-05	<	1.34E-03
2		8		1:45pm Oct 20 -	<	5.09E-05	<	1.02E-03
3		7		1:50pm Oct. 20 -	<	5.62E-05	<	1.12E-03
3		6		1:40pm Oct. 20 -	<	6.18E-05	<	1.24E-03
3		5		1:35pm Oct. 20 -	0.30	1.39E-04	<	1.16E-03
3		4		12:20pm Oct 20	<	4.21E-05	<	8.41E-04
4		3		12:25pm Oct 20	<	4.97E-05	<	9.94E-04
Daily Calculations								
min					0.125	4.21E-05	2.5	8.41E-04
max					0.3	1.39E-04	2.5	1.34E-03
median					0.125	5.90E-05	2.5	1.14E-03
mean					0.147	6.61E-05	2.5	1.12E-03
standard deviation					0.062	3.06E-05	0	1.62E-04
Reference								
		2		1:15pm Oct. 20 -	<	5.90E-05	<	1.18E-03
		1		12:50pm Oct. 20 -	<	4.57E-05	<	9.13E-04
1		10	Oct 21-22/98	2:20pm Oct. 21 -	<	6.03E-05	<	1.21E-03
2		9		2:15pm Oct. 21 -	<	6.83E-05	<	1.37E-03
2		8		2:10pm Oct. 21 -	<	5.23E-05	<	1.05E-03
3		7		1:55pm Oct. 21 -	<	5.77E-05	<	1.15E-03
3		6		1:50pm Oct. 21 -	<	6.28E-05	<	1.26E-03
3		5		1:40pm Oct. 21 -	<	5.80E-05	<	1.16E-03
3		4		1:00pm Oct. 21 -	<	4.35E-05	<	8.71E-04
4		3		1:05pm Oct. 21 -	<	5.08E-05	<	1.02E-03
Daily Calculations								
min					0.125	4.35E-05	2.5	8.71E-04
max					0.125	6.83E-05	2.5	1.37E-03
median					0.125	5.78E-05	2.5	1.16E-03
mean					0.125	5.67E-05	2.5	1.13E-03
standard deviation					0	7.70E-06	0	1.54E-04
Reference								
		2		12:55pm Oct. 21 -	<	5.77E-05	<	1.15E-03
		1		12:35pm Oct. 21 -	<	4.42E-05	<	8.84E-04

Zone	Study ID RL	Location Number	Sample Date	Sample Time	Sample Period (min)	Volume of air (m3)	Cobalt ug/filter 0 75	Air Conc. ug/m3	Lead ug/filter 5	Air Conc. ug/m3	Nickel ug/filter 0 5	Air Conc. ug/m3	Silver ug/filter 0 75	Air Conc. ug/m3	Arsenic ug/filter 0 25	Air Conc. ug/m3	Uranium ug/filter 5	Air Conc. ug/m3
1		10	Oct 19-20/98	12 55pm Oct 19 - 2 05pm Oct 20	1510	2132	<	1 76E-04	<	1 17E-03	<	1 17E-04	<	1 76E-04	<	5 86E-05	<	1 17E-03
2		9		12 50pm Oct 19 - 2 00pm Oct 20	1510	1910	<	1 96E-04	<	1 31E-03	<	1 31E-04	<	1 96E-04	<	6 55E-05	<	1 31E-03
2		8		12 45pm Oct 19 - 1 45pm Oct 20	1500	2476	<	1 51E-04	<	1 01E-03	0 67	2 71E-04	<	1 51E-04	<	5 05E-05	<	1 01E-03
3		7		12 40pm Oct 19 - 1 50pm Oct 20	1510	2323	<	1 61E-04	<	1 08E-03	0 65	2 80E-04	<	1 61E-04	0 31	1 33E-04	<	1 08E-03
3		6		12 35pm Oct 19 - 1 40pm Oct 20	1505	2077	<	1 81E-04	<	1 20E-03	0 60	2 89E-04	<	1 81E-04	<	6 02E-05	<	1 20E-03
3		5		12 30pm Oct 19 - 1 35pm Oct 20	1535	2174	<	1 72E-04	<	1 15E-03	0 70	3 22E-04	<	1 72E-04	0 28	1 29E-04	<	1 15E-03
3		4		12 10pm Oct 19 - 12 20pm Oct 20	1450	2861	<	1 31E-04	<	8 74E-04	0 60	2 10E-04	<	1 31E-04	<	4 37E-05	<	8 74E-04
4		3		12 15pm Oct 19 - 12 25pm Oct 20	1450	2464	<	1 52E-04	<	1 01E-03	0 56	2 27E-04	<	1 52E-04	<	5 07E-05	<	1 01E-03
	Daily Calculations																	
	min						0 375	1 31E-04	2 5	8 74E-04	0 25	1 17E-04	0 375	1 31E-04	0 125	4 37E-05	2 5	8 74E-04
	max						0 375	1 96E-04	2 5	1 31E-03	0 7	3 22E-04	0 375	1 96E-04	0 31	1 33E-04	2 5	1 31E-03
	median						0 375	1 67E-04	2 5	1 11E-03	0 6	2 49E-04	0 375	1 67E-04	0 125	5 94E-05	2 5	1 11E-03
	mean						0 375	1 65E-04	2 5	1 10E-03	0 535	2 31E-04	0 375	1 65E-04	0 168	7 39E-05	2 5	1 10E-03
	standard deviation						0	2 04E-05	0	1 36E-04	0 181	7 46E-05	0	2 04E-05	0 079	3 59E-05	0	1 36E-04
	Reference																	
		2		12 05pm Oct 19 - 1 15pm Oct 20	1510	2275	<	1 65E-04	<	1 10E-03	<	1 10E-04	<	1 65E-04	<	5 49E-05	<	1 10E-03
		1		11 40am Oct 19 - 12 55pm Oct 20	1515	2883	<	1 30E-04	<	8 67E-04	0 56	1 94E-04	<	1 30E-04	<	4 34E-05	<	8 67E-04
1		10	Oct 20-21/98	2 05pm Oct 20 - 2 20pm Oct 21	1455	2016	<	1 86E-04	<	1 24E-03	<	1 24E-04	<	1 86E-04	<	6 20E-05	<	1 24E-03
2		9		2 00pm Oct 20 - 2 15pm Oct 21	1455	1863	<	2 01E-04	<	1 34E-03	<	1 34E-04	<	2 01E-04	<	6 71E-05	<	1 34E-03
2		8		1 45pm Oct 20 - 2 10pm Oct 21	1465	2454	<	1 53E-04	<	1 02E-03	<	1 02E-04	<	1 53E-04	<	5 09E-05	<	1 02E-03
3		7		1 50pm Oct 20 - 1 55pm Oct 21	1445	2223	<	1 69E-04	<	1 12E-03	<	1 12E-04	<	1 69E-04	<	5 62E-05	<	1 12E-03
3		6		1 40pm Oct 20 - 1 50m Oct 21	1450	2021	<	1 86E-04	<	1 24E-03	<	1 24E-04	<	1 86E-04	<	6 18E-05	<	1 24E-03
3		5		1 35pm Oct 20 - 1 45pm Oct 21	1450	2154	<	1 74E-04	<	1 16E-03	<	1 16E-04	<	1 74E-04	0 30	1 39E-04	<	1 16E-03
3		4		12 20pm Oct 20 - 1 00pm Oct 21	1480	2973	<	1 26E-04	<	8 41E-04	0 51	1 72E-04	<	1 26E-04	<	4 21E-05	<	8 41E-04
4		3		12 25pm Oct 20 - 1 05pm Oct 21	1480	2515	<	1 49E-04	<	9 94E-04	<	9 94E-05	<	1 49E-04	<	4 97E-05	<	9 94E-04
	Daily Calculations																	
	min						0 375	1 26E-04	2 5	8 41E-04	0 25	9 94E-05	0 375	1 26E-04	0 125	4 21E-05	2 5	8 41E-04
	max						0 375	2 01E-04	2 5	1 34E-03	0 51	1 72E-04	0 375	2 01E-04	0 3	1 39E-04	2 5	1 34E-03
	median						0 375	1 71E-04	2 5	1 14E-03	0 25	1 20E-04	0 375	1 71E-04	0 125	5 90E-05	2 5	1 14E-03
	mean						0 375	1 68E-04	2 5	1 12E-03	0 283	1 23E-04	0 375	1 68E-04	0 147	6 61E-05	2 5	1 12E-03
	standard deviation						0	2 42E-05	0	1 62E-04	0 092	2 28E-05	0	2 42E-05	0 062	3 06E-05	0	1 62E-04
	Reference																	
		2		1 15pm Oct 20 - 12 55pm Oct 21	1420	2119	<	1 77E-04	<	1 18E-03	<	1 18E-04	<	1 77E-04	<	5 90E-05	<	1 18E-03
		1		12 50pm Oct 20 - 12 35pm Oct 21	1425	2737	<	1 37E-04	<	9 13E-04	0 77	2 81E-04	<	1 37E-04	<	4 57E-05	<	9 13E-04
1		10	Oct 21-22/98	2 20pm Oct 21 - 3 25pm Oct 22	1505	2072	<	1 81E-04	<	1 21E-03	<	1 21E-04	<	1 81E-04	<	6 03E-05	<	1 21E-03
2		9		2 15pm Oct 21 - 3 20pm Oct 22	1505	1831	<	2 05E-04	<	1 37E-03	<	1 37E-04	<	2 05E-04	<	6 83E-05	<	1 37E-03
2		8		2 10pm Oct 21 - 2 55pm Oct 22	1485	2391	<	1 57E-04	<	1 05E-03	<	1 05E-04	<	1 57E-04	<	5 23E-05	<	1 05E-03
3		7		1 55pm Oct 21 - 2 35pm Oct 22	1480	2168	<	1 73E-04	<	1 15E-03	<	1 15E-04	<	1 73E-04	<	5 77E-05	<	1 15E-03
3		6		1 50pm Oct 21 - 2 30pm Oct 22	1480	1989	<	1 89E-04	<	1 26E-03	<	1 26E-04	<	1 89E-04	<	6 28E-05	<	1 26E-03
3		5		1 40pm Oct 21 - 2 25pm Oct 22	1485	2155	<	1 74E-04	<	1 16E-03	<	1 16E-04	<	1 74E-04	<	5 80E-05	<	1 16E-03
3		4		1 00pm Oct 21 - 1 55pm Oct 22	1495	2871	<	1 31E-04	<	8 71E-04	<	8 71E-05	<	1 31E-04	<	4 35E-05	<	8 71E-04
4		3		1 05pm Oct 21 - 2 15pm Oct 22	1510	2460	<	1 52E-04	<	1 02E-03	<	1 02E-04	<	1 52E-04	<	5 08E-05	<	1 02E-03
	Daily Calculations																	
	min						0 375	1 31E-04	2 5	8 71E-04	0 25	8 71E-05	0 375	1 31E-04	0 125	4 35E-05	2 5	8 71E-04
	max						0 375	2 05E-04	2 5	1 37E-03	0 25	1 37E-04	0 375	2 05E-04	0 125	6 83E-05	2 5	1 37E-03
	median						0 375	1 73E-04	2 5	1 16E-03	0 25	1 16E-04	0 375	1 73E-04	0 125	5 78E-05	2 5	1 16E-03
	mean						0 375	1 70E-04	2 5	1 13E-03	0 25	1 13E-04	0 375	1 70E-04	0 125	5 67E-05	2 5	1 13E-03
	standard deviation						0	2 31E-05	0	1 54E-04	0	1 54E-05	0	2 31E-05	0	7 70E-06	0	1 54E-04
	Reference																	
		2		12 55pm Oct 21 - 1 50pm Oct 22	1495	2167	<	1 73E-04	<	1 15E-03	<	1 15E-04	<	1 73E-04	<	5 77E-05	<	1 15E-03
		1		12 35pm Oct 21 - 1 35pm Oct 22	1500	2827	<	1 33E-04	<	8 84E-04	<	8 84E-05	<	1 33E-04	<	4 42E-05	<	8 84E-04

Zone	Study ID RL	Location Number	Sample Date	Sample Time	Sample Period (min)	Volume of air (m3)	Cobalt ug/filter 0 75	Air Conc. ug/m3	Lead ug/filter 5	Air Conc. ug/m3	Nickel ug/filter 0 5	Air Conc. ug/m3	Silver ug/filter 0 75	Air Conc. ug/m3	Arsenic ug/filter 0 25	Air Conc ug/m3	Uranium ug/filter 5	Air Conc. ug/m3
1		10	Oct 22-23/98	3 25pm Oct 22 - 2 10pm Oct 23	1365	1867	<	2 01E-04	<	1 34E-03	<	1 34E-04	<	2 01E-04	<	6 69E-05	<	1 34E-03
2		9		3 20pm Oct 22 - 2 05pm Oct 23	1365	1694	<	2 21E-04	<	1 48E-03	<	1 48E-04	<	2 21E-04	<	7 38E-05	<	1 48E-03
2		8		2 55pm Oct 22 - 2 00pm Oct 23	1365	2219	<	1 69E-04	<	1 13E-03	<	1 13E-04	<	1 69E-04	<	5 63E-05	<	1 13E-03
3		7		2 35pm Oct 22 - 1 30pm Oct 23	1375	2082	<	1 80E-04	<	1 20E-03	<	1 20E-04	<	1 80E-04	<	6 00E-05	<	1 20E-03
3		6		2 30pm Oct 22 - 1 25pm Oct 23	1375	1838	<	2 04E-04	<	1 36E-03	<	1 36E-04	<	2 04E-04	<	6 80E-05	<	1 36E-03
3		5		2 25pm Oct 22 - 1 05pm Oct 23	1360	1950	<	1 92E-04	<	1 28E-03	<	1 28E-04	<	1 92E-04	<	6 41E-05	<	1 28E-03
3		4		1 55pm Oct 22 - 12 50pm Oct 23	1375	2520	<	1 49E-04	<	9 92E-04	<	9 92E-05	<	1 49E-04	<	4 96E-05	<	9 92E-04
4		3		2 15pm Oct 22 - 12 55pm Oct 23	1360	2240	<	1 67E-04	<	1 12E-03	<	1 12E-04	<	1 67E-04	<	5 58E-05	<	1 12E-03
	Daily Calculations																	
	min						0 375	1 49E-04	2 5	9 92E-04	0 25	9 92E-05	0 375	1 49E-04	0 125	4 96E-05	2 5	9 92E-04
	max						0 375	2 21E-04	2 5	1 48E-03	0 25	1 48E-04	0 375	2 21E-04	0 125	7 38E-05	2 5	1 48E-03
	median						0 375	1 86E-04	2 5	1 24E-03	0 25	1 24E-04	0 375	1 86E-04	0 125	6 21E-05	2 5	1 24E-03
	mean						0 375	1 85E-04	2 5	1 24E-03	0 25	1 24E-04	0 375	1 85E-04	0 125	6 18E-05	2 5	1 24E-03
	standard deviation						0	2 36E-05	0	1 57E-04	0	1 57E-05	0	2 36E-05	0	7 86E-06	0	1 57E-04
	Reference																	
		2		1 50pm Oct 22 - 12 45pm Oct 23	1375	1993	<	1 88E-04	<	1 25E-03	<	1 25E-04	<	1 88E-04	<	6 27E-05	<	1 25E-03
		1		1 35pm Oct 22 - 12 35pm Oct 23	1380	2551	<	1 47E-04	<	9 80E-04	<	9 80E-05	<	1 47E-04	<	4 90E-05	<	9 80E-04
1		10	Oct 23-24/98	2 10pm Oct 23 - 1 45pm Oct 24	1415	1899	<	1 98E-04	<	1 32E-03	<	1 32E-04	<	1 98E-04	<	6 58E-05	<	1 32E-03
2		9		2 05pm Oct 23 - 1 30pm Oct 24	1405	1799	<	2 08E-04	<	1 39E-03	<	1 39E-04	<	2 08E-04	<	6 95E-05	<	1 39E-03
2		8		2 00pm Oct 23 - 1 00pm Oct 24	1380	2178	<	1 72E-04	<	1 15E-03	<	1 15E-04	<	1 72E-04	<	5 74E-05	<	1 15E-03
3		7		1 30pm Oct 23 - 12 55pm Oct 24	1405	2081	<	1 80E-04	<	1 20E-03	<	1 20E-04	<	1 80E-04	0 41	1 97E-04	<	1 20E-03
3		6		1 25pm Oct 23 - 12 45pm Oct 24	1420	1878	<	2 00E-04	<	1 33E-03	0 91	4 85E-04	<	2 00E-04	0 26	1 38E-04	<	1 33E-03
3		5		1 05pm Oct 23 - 12 40pm Oct 24	1415	1931	<	1 94E-04	5 4	2 80E-03	1 0	5 18E-04	<	1 94E-04	0 86	4 45E-04	<	1 29E-03
3		4		12 50pm Oct 23 - 12 30pm Oct 24	1420	2602	<	1 44E-04	<	9 61E-04	0 58	2 23E-04	<	1 44E-04	0 31	1 19E-04	<	9 61E-04
4		3		12 55pm Oct 23 - 12 35pm Oct 24	1420	2276	<	1 65E-04	<	1 10E-03	<	1 10E-04	<	1 65E-04	<	5 49E-05	<	1 10E-03
	Daily Calculations																	
	min						0 375	1 44E-04	2 5	9 61E-04	0 25	1 10E-04	0 375	1 44E-04	0 125	5 49E-05	2 5	9 61E-04
	max						0 375	2 08E-04	5 4	2 80E-03	1	5 18E-04	0 375	2 08E-04	0 86	4 45E-04	2 5	1 39E-03
	median						0 375	1 87E-04	2 5	1 26E-03	0 25	1 35E-04	0 375	1 87E-04	0 193	9 43E-05	2 5	1 25E-03
	mean						0 375	1 83E-04	2 863	1 41E-03	0 468	2 30E-04	0 375	1 83E-04	0 293	1 43E-04	2 5	1 22E-03
	standard deviation						0	2 15E-05	1 025	5 79E-04	0 323	1 71E-04	0	2 15E-05	0 253	1 32E-04	0	1 43E-04
	Reference																	
		2		12 45pm Oct 23 - 12 25pm Oct 24	1420	1978	<	1 90E-04	16	8 09E-03	0 60	3 03E-04	<	1 90E-04	0 37	1 87E-04	<	1 26E-03
		1		12 35pm Oct 23 - 10 45pm Oct 24	1330	2410	<	1 56E-04	<	1 04E-03	0 56	2 32E-04	<	1 56E-04	0 45	1 87E-04	<	1 04E-03
	Overall (not including Reference values)																	
	min						0 375	1 24E-04	2 5	8 29E-04	0 25	8 29E-05	0 375	1 24E-04	0 125	4 21E-05	2 5	8 29E-04
	max						0 375	2 21E-04	8 2	4 04E-03	1 1	5 94E-04	0 375	2 21E-04	0 89	4 45E-04	2 5	1 48E-03
	median						0 375	1 72E-04	2 5	1 15E-03	0 25	1 34E-04	0 375	1 72E-04	0 125	6 11E-05	2 5	1 14E-03
	mean						0 375	1 70E-04	2 68	1 21E-03	0 462	2 09E-04	0 375	1 70E-04	0 225	1 00E-04	2 5	1 13E-03
	standard deviation						0	2 18E-05	0 93	4 35E-04	0 270	1 29E-04	0	2 18E-05	0 182	7 98E-05	0	1 45E-04

Zone	Study ID	Location Number	Sample Date	Sam	Arsenic ug/filter	Air Conc. ug/m3	Uranium ug/filter	Air Conc. ug/m3
	RL				0 25		5	
	QA/QC							
	TRIP BLANKS							
	Trip Blank A				<		<	
	Trip Blank B				<		<	
	FIELD BLANKS							
	Field Blank		Oct 15-16/98		<		<	
	Field Blank A				<		<	
	Field Blank B				<		<	
	Field Blank C				<		<	
	Field Blank D				<		<	
	LAB DUPLICATES							
	g	4	Oct 16-17/98	9:05am Oct. 16 - 9	0 58		<	
	g	4	Oct 14-15/98	9 03am Oct. 14 - 8	<		<	
	bb	8	Oct 13-14/98	9:35am Oct. 13 - 9	0 30		<	
	bw	10	Oct 13-14/98	9 45am Oct. 13 - 9	0 34		<	
	b	2	Oct 20-21/98	1.15pm Oct. 20 - 1	<		<	
	bb	8	Oct 15-16/98	9.15am Oct. 15 - 1	<		<	
	bp	9	Oct 19-20/98	12:50pm Oct. 19 -	<		<	
	SAMPLE DUPLICATES							
	g	4	Oct 14-15/98	9 03am Oct. 14 - 8	<		<	
	l	3	Oct 15-16/98	8:55am Oct. 15 - 1	<		<	
	bb	8	Oct 23-24/98	2:00pm Oct. 23 - 1	<		<	
	bb	8	Oct 13-14/98	9:35am Oct. 13 - 9	0 32		<	
	b	2	Oct 20-21/98	1:15pm Oct. 20 - 1	<		<	
	CRITERIA							
	AAQC		Current			0 3		nc
			Proposed			0 05		nc
	POI STANDARD		Current			1		nc
			Proposed			0.15		nc
	TYPICAL		Lower range			1		
			Upper Range			1.9		

Notes: RL
<
0 5*RL used to calculated min, max, etc
nc - no criteria established
POI - Point of Impingement (ie 30 minute Ontarion R
Typical - values presented in the "Draft Rationale fo

Zone	Study ID	Location Number	Sample Date	Sample Time	Sample Period (min)	Volume of air (m3)	Cobalt ug/filter	Air Conc ug/m3	Lead ug/filter	Air Conc. ug/m3	Nickel ug/filter	Air Conc. ug/m3	Silver ug/filter	Air Conc ug/m3	Arsenic ug/filter	Air Conc. ug/m3	Uranium ug/filter	Air Conc. ug/m3
	RL						0 75		5		0 5		0 75		0 25		5	
	QA/QC																	
	TRIP BLANKS																	
	Trip Blank A						<		<		<		<		<		<	
	Trip Blank B						<		<		<		<		<		<	
	FIELD BLANKS																	
	Field Blank		Oct 15-16/98				<		<		<		<		<		<	
	Field Blank A						<		<		<		<		<		<	
	Field Blank B						<		<		0 50		<		<		<	
	Field Blank C						<		<		<		<		<		<	
	Field Blank D						<		<		<		<		<		<	
	LAB DUPLICATES																	
	g	4	Oct 16-17/98	9 05am Oct 16 - 9 35am Oct 17	1470		<		5 7		0 52		<		0 58		<	
	g	4	Oct 14-15/98	9 03am Oct 14 - 8 50am Oct 15	1423		<		<		0 78		<		<		<	
	bb	8	Oct 13-14/98	9 35am Oct 13 - 9 30am Oct 14	1435		<		<		0 7		<		0 30		<	
	bw	10	Oct 13-14/98	9 45am Oct 13 - 9 50am Oct 14	1445		<		7 3		1 4		<		0 34		<	
	b	2	Oct 20-21/98	1 15pm Oct 20 - 12 55pm Oct 21	1420		<		<		<		<		<		<	
	bb	8	Oct 15-16/98	9 15am Oct 15 - 11 13am Oct 16	1558		<		<		<		<		<		<	
	bp	9	Oct 19-20/98	12 50pm Oct 19 - 2 00pm Oct 20	1510		<		<		0 60		<		<		<	
	SAMPLE DUPLICATES																	
	g	4	Oct 14-15/98	9 03am Oct 14 - 8 50am Oct 15	1423		<		<		0 86		<		<		<	
	l	3	Oct 15-16/98	8 55am Oct 15 - 10 45am Oct 16	1550		<		<		<		<		<		<	
	bb	8	Oct 23-24/98	2 00pm Oct 23 - 1 00pm Oct 24	1380		<		<		<		<		<		<	
	bb	8	Oct 13-14/98	9 35am Oct 13 - 9 30am Oct 14	1435		<		<		0 7		<		0 32		<	
	b	2	Oct 20-21/98	1 15pm Oct 20 - 12 55pm Oct 21	1420		<		<		<		<		<		<	
	CRITERIA																	
	AAQC		Current					0 1		2 0		2 0		1 0		0 3		nc
			Proposed									0 2				0 05		nc
	POI STANDARD		Current					0 3		6		5		3		1		nc
			Proposed									0 6				0 15		nc
	TYPICAL		Lower range													1		
			Upper Range													1 9		

Notes RL

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0 5*RL used to calculated min max etc

nc - no criteria established

POI - Point of Impingement (ie 30 minute Ontarion Reg 346)

Typical - values presented in the "Draft Rationale for the Development of Soil Drinking Water Surface Water and Air Quality Criteria for Arsenic" MOEE, Standards Development Branch, Feb 1996

Appendix D.3: Outdoor Air Analyzed for Radion

Zone	RL	Location #	Sample Date		Po-210 (Bq/filter)	Po-210 Air Conc. Bq/m3	Th-230 Bq/ half filter	Th-230 (Bq/filter)	Th-230 Air Conc. Bq/m3
1		10	Oct 8-9/98	4:30pm O					
2		9		4:20pm O					
2		8		4:10pm O					
3		7		3:30pm O					
3		6		2:35pm O					
3		5		2:30pm O					
3		4		2:15pm O					
4		3		5:00pm O					
	Daily Calculations								
	min								
	max								
	median								
	mean								
	standard deviation								
	Reference								
		2		2:00pm O					
		1		6:00pm O					
1		10	Oct 13-14/98	9:45am O					
2		9		9:40am O					
2		8		9:35am O					
3		7		9:30am O					
3		6		9:25am O					
3		5		9:20am O					
3		4		8:55am O					
4		3		9:00am O					
	Daily Calculations								
	min								
	max								
	median								
	mean								
	standard deviation								
	Reference								
		2		8:50am O					
		1		8:00am O					
1		10	Oct 14-15/98	9:50am O					
2		9		9:45am O					
2		8		9:30am O					
3		7		9:40am O					
3		6		9:25am O					
3		5		9:18am O					
3		4		9:03am O					
4		3		9:15am O					
	Daily Calculations								
	min								

Appendix D.3: Outdoor Air Analyzed for Radionuclides

Zone	Location #	Sample Date	Sample Time	Sample Period (min)	Volume of Air (m3)	Pb-210 Bq/ half filter	Pb-210 (Bq/filter)	Pb-210 Air Conc. Bq/m3	Ra-226 Bq/ half filter	Ra-226 (Bq/filter)	Ra-226 Air Conc. Bq/m3	Po-210 Bq/ half filter	Po-210 (Bq/filter)	Po-210 Air Conc. Bq/m3	Th-230 Bq/ half filter	Th-230 (Bq/filter)	Th-230 Air Conc. Bq/m3
	RL					0 02			0 01			-			-		
1	10	Oct 8-9/98	4 30pm Oct 8 - 5 05 Oct 9	1475	2108	0 16	0 32	0 000152	0 01	0 02	0 000009						
2	9		4 20pm Oct 8 - 5 00 Oct 9	1480	1931	0 10	0 20	0 000104	0 04	0 08	0 000041						
2	8		4 10pm Oct 8 - 4 55 Oct 9	1485	2463	0 24	0 48	0 000195	0 01	0 02	0 000008						
3	7		3 30pm Oct 8 - 4 50 Oct 9	1520	2326	0 12	0 24	0 000103	<0 01	0 01	0 000004						
3	6		2 35pm Oct 8 - 4 45 Oct 9	1570	2166	0 18	0 36	0 000166	<0 01	0 01	0 000005						
3	5		2 30pm Oct 8 - 4 43 Oct 9	1603	2298	0 28	0 56	0 000244	<0 01	0 01	0 000004						
3	4		2 15pm Oct 8 - 4 40 Oct. 9	1585	3016	0 30	0 60	0 000199	0 01	0 02	0 000007						
4	3		5 00pm Oct 8 - 5 08 Oct 9	1448	2486	0 28	0 56	0 000225	0 01	0 02	0 000008						
Daily Calculations																	
min				1448	1931		0 20	0 00010316		0 01	0 000004						
max				1603	3016		0 60	0 00024367		0 08	0 000041						
median				1503	2312		0 42	0 00018052		0 02	0 000007						
mean				1521	2349		0 42	0 00017343		0 02	0 000011						
standard deviation				58	327		0 16	0 000052		0 02	0 000013						
Reference																	
	2		2 00pm Oct 8 - 4 30 Oct 9	1590	2192	0 28	0 56	0 00025544	0 01	0 02	0 000009						
	1		6 00pm Oct 8 - 8 00pm Oct 9	1560	3025	0 22	0 44	0 000145	<0 01	0 01	0 000003						
1	10	Oct 13-14/98	9 45am Oct 13 - 9 50am Oct 14	1445	2027	0 88	1 76	0 000868	0 01	0 02	0 000010						
2	9		9 40am Oct 13 - 9 45am Oct 14	1445	1850	1 08	2 16	0 001167	<0 01	0 01	0 000005						
2	8		9 35am Oct 13 - 9 30am Oct 14	1435	2288	1 40	2 80	0 001224	<0 01	0 01	0 000004						
3	7		9 30am Oct 13 - 9 25am Oct 14	1435	2208	1 12	2 24	0 001014	<0 01	0 01	0 000005						
3	6		9 25am Oct 13 - 9 20am Oct 14	1435	1959	1 46	2 92	0 001490	0 02	0 04	0 000020						
3	5		9 20am Oct 13 - 9 15am Oct 14	1435	2181	1 72	3 44	0 001577	0 04	0 08	0 000037						
3	4		8 55am Oct 13 - 9 00am Oct 14	1445	2750	1 74	3 48	0 001266	0 03	0 06	0 000022						
4	3		9 00am Oct 13 - 9 10am Oct 14	1450	2452	1 96	3 92	0 001599	0 04	0 08	0 000033						
Daily Calculations																	
min				1435	1850		1 76	0 00086818		0 01	0 000004						
max				1450	2750		3 92	0 00159898		0 08	0 000037						
median				1440	2195		2 86	0 00124477		0 03	0 000015						
mean				1441	2214		2 84	0 00127574		0 04	0 000017						
standard deviation				6	288		0 75	0 000265		0 03	0 000013						
Reference																	
	2		8 50am Oct 13 - 8 54am Oct 14	1444	2093	1 14	2 28	0 00108911	0 02	0 04	0 000019						
	1		8 00am Oct 13 - 8 20am Oct 14	1460	2831	1 42	2 84	0 001003	0 01	0 02	0.000007						
1	10	Oct 14-15/98	9 50am Oct 14 - 9 30am Oct 15	1420	2116	0 24	0 48	0 000227	0 01	0 02	0 000009						
2	9		9 45am Oct 14 - 9 25am Oct 15	1420	1966	0 30	0 60	0 000305	0 04	0 08	0 000041						
2	8		9 30am Oct 14 - 9 15am Oct 15	1425	2318	0 44	0 88	0 000380	<0 01	0 01	0 000004						
3	7		9 40am Oct 14 - 9 20am Oct 15	1420	2173	0 44	0 88	0 000405	0 01	0 02	0 000009						
3	6		9 25am Oct 14 - 9 05am Oct 15	1420	1969	0 32	0 64	0 000325	0 02	0 04	0 000020						
3	5		9 18am Oct 14 - 9 00am Oct 15	1422	2088	0 40	0 80	0 000383	0 05	0 10	0 000048						
3	4		9 03am Oct 14 - 8 50am Oct 15	1423	2783	0 50	1 00	0 000359	0 02	0 04	0.000014						
4	3		9 15am Oct 14 - 8 55am Oct 15	1420	2401	0 38	0 76	0 000317	0 03	0 06	0.000025						
Daily Calculations																	
min				1420	1966		0 48	0 00022681		0 01	0 000004						

Zone	Location # / RL	Sample Date	Sample Time	Sample Period (min)	Volume of Air (m3)	Pb-210 Bq/ half filter	Pb-210 (Bq/filter)	Pb-210 Air Conc. Bq/m3	Ra-226 Bq/ half filter	Ra-226 (Bq/filter)	Ra-226 Air Conc. Bq/m3	Po-210 Bq/ half filter	Po-210 (Bq/filter)	Po-210 Air Conc. Bq/m3	Th-230 Bq/ half filter	Th-230 (Bq/filter)	Th-230 Air Conc. Bq/m3
						0.02			0.01			-			-		
max				1425	2783		1.00	0.0004049		0.10	0.000048						
median				1420	2145		0.78	0.00034215		0.04	0.000017						
mean				1421	2227		0.76	0.00033759		0.05	0.000021						
standard deviation				2	272		0.17	0.000057		0.03	0.000016						
Reference																	
	2		8.54am Oct 14 - 8.35am Oct 15	1421	2100	0.38	0.76	0.00036183	0.04	0.08	0.000038						
	1		8.20am Oct 14 - 7.40am Oct 15	1400	2715	0.40	0.80	0.000295	0.01	0.02	0.000007						
1	10	Oct 15-16/98	9.35am Oct 15 - 11.35am Oct 16	1560	2243	0.38	0.76	0.000339	0.01	0.02	0.000009	0.085	0.170	0.000076	0.014	0.028	0.000012
2	9		9.25am Oct 15 - 11.20am Oct 16	1555	2090	0.29	0.58	0.000277	0.01	0.02	0.000010	0.076	0.152	0.000073	0.017	0.034	0.000016
2	8		9.15am Oct 15 - 11.13am Oct 16	1558	2584	0.60	1.20	0.000464	0.01	0.02	0.000008	0.107	0.214	0.000083	0.026	0.052	0.000020
3	7		9.20am Oct 15 - 11.05am Oct 16	1545	2390	0.41	0.82	0.000343	0.01	0.02	0.000008	0.106	0.212	0.000089	0.019	0.038	0.000016
3	6		9.05am Oct 15 - 11.00am Oct 16	1555	2190	0.47	0.94	0.000429	0.01	0.02	0.000009	0.089	0.178	0.000081	0.029	0.058	0.000026
3	5		9.00am Oct 15 - 10.53am Oct 16	1553	2307	0.47	0.94	0.000407	0.01	0.02	0.000009	0.109	0.218	0.000094	0.035	0.070	0.000030
3	4		8.50am Oct 15 - 9.05am Oct 16	1455	2948	0.54	1.08	0.000366	0.01	0.02	0.000007	0.091	0.182	0.000062	0.026	0.052	0.000018
4	3		8.55am Oct 15 - 10.45am Oct 16	1550	2661	0.41	0.82	0.000308	0.01	0.02	0.000008	0.093	0.186	0.000070	0.022	0.044	0.000017
Daily Calculations																	
min				1455	2090		0.58	0.00027746		0.02	0.000007	0.076	0.152	0.000062	0.014	0.028	0.000012
max				1560	2948		1.20	0.00046432		0.02	0.000010	0.109	0.218	0.000094	0.035	0.070	0.000030
median				1554	2348		0.88	0.00035472		0.02	0.000009	0.092	0.184	0.000079	0.024	0.048	0.000017
mean				1541	2427		0.89	0.00036685		0.02	0.000008	0.095	0.189	0.000078	0.024	0.047	0.000019
standard deviation				35	285		0.19	0.000063		0.00	0.000001	0.012	0.024	0.000011	0.007	0.014	0.000006
Reference																	
	2		pump down														
	1		7.45am Oct 15 - 7.45am Oct 16	1440	2819	0.62	1.24	0.000440	0.01	0.02	0.000007	0.100	0.200	0.000071	0.016	0.032	0.000011
1	10	Oct 16-17/98	11.35am Oct 16 - 11.50am Oct 17	1455	2041	0.64	1.28	0.000627	0.03	0.06	0.000029						
2	9		11.20am Oct 16 - 11.45am Oct 17	1465	1899	0.60	1.20	0.000632	0.02	0.04	0.000021						
2	8		11.13am Oct 16 - 11.40am Oct 17	1467	2422	1.04	2.08	0.000859	0.02	0.04	0.000017						
3	7		11.05am Oct 16 - 11.35am Oct 17	1470	2274	0.76	1.52	0.000668	0.01	0.02	0.000009						
3	6		11.00am Oct 16 - 11.25am Oct 17	1470	2049	0.80	1.60	0.000781	0.01	0.02	0.000010						
3	5		10.53am Oct 16 - 11.25am Oct 17	1472	2237	1.34	2.68	0.001198	0.03	0.06	0.000027						
3	4		9.05am Oct 16 - 9.35am Oct 17	1470	2901	0.96	1.92	0.000662	0.04	0.08	0.000028						
4	3		10.45am Oct 16 - 11.15am Oct 17	1470	2460	0.92	1.84	0.000748	0.02	0.04	0.000016						
Daily Calculations																	
min				1455	1899		1.20	0.00062706		0.02	0.000009						
max				1472	2901		2.68	0.00119781		0.08	0.000029						
median				1470	2256		1.72	0.00070826		0.04	0.000019						
mean				1467	2285		1.77	0.00077184		0.05	0.000020						
standard deviation				5	315		0.43	0.000190		0.02	0.000008						
Reference																	
	2		pump down	-		-	-	-	-	-	-						
	1		7.45am Oct 16 - 7.50am Oct 17	1445	2828	0.68	1.36	0.000481	0.03	0.06	0.000021						
1	10	Oct 19-20/98	12.55pm Oct 19 - 2.05pm Oct 20	1510	2132	0.24	0.48	0.000225	0.03	0.06	0.000028						
2	9		12.50pm Oct 19 - 2.00pm Oct 20	1510	1910	0.48	0.96	0.000503	0.01	0.02	0.000010						
2	8		12.45pm Oct 19 - 1.45pm Oct 20	1500	2476	0.62	1.24	0.000501	0.01	0.02	0.000008						
3	7		12.40pm Oct 19 - 1.50pm Oct 20	1510	2323	0.40	0.80	0.000344	<0.01	0.01	0.000004						

Zone	RL	Location #	Sample Date		Po-210 (Bq/filter)	Po-210 Air Conc. Bq/m3	Th-230 Bq/ half filter	Th-230 (Bq/filter)	Th-230 Air Conc. Bq/m3
3		6		12:35pm (					
3		5		12:30pm (					
3		4		12:10pm (					
4		3		12:15pm (					
	Daily Calculations								
	min								
	max								
	median								
	mean								
	standard deviation								
	Reference								
		2		12:05pm (					
		1		11:40am (					
1		10	Oct 20-21/98	2:05pm O					
2		9		2:00pm O					
2		8		1:45pm O					
3		7		1:50pm O					
3		6		1:40pm O					
3		5		1:35pm O					
3		4		12:20pm (					
4		3		12:25pm (					
	Daily Calculations								
	min								
	max								
	median								
	mean								
	standard deviation								
	Reference								
		2		1:15pm Oc					
		1		12:50pm C					
1		10	Oct 21-22/98	2:20pm Oc					
2		9		2:15pm Oc					
2		8		2:10pm Oc					
3		7		1:55pm Oc					
3		6		1:50pm Oc					
3		5		1:40pm Oc					
3		4		1:00pm Oc					
4		3		1:05pm Oc					
	Daily Calculations								
	min								
	max								
	median								
	mean								
	standard deviation								
	Reference								
		2		12:55pm C					

Zone	RL	Location #	Sample Date	Sample Time	Sample Period (min)	Volume of Air (m3)	Pb-210 Bq/ half filter	Pb-210 (Bq/filter)	Pb-210 Air Conc. Bq/m3	Ra-226 Bq/ half filter	Ra-226 (Bq/filter)	Ra-226 Air Conc. Bq/m3	Po-210 Bq/ half filter	Po-210 (Bq/filter)	Po-210 Air Conc. Bq/m3	Th-230 Bq/ half filter	Th-230 (Bq/filter)	Th-230 Air Conc. Bq/m3
							0.02			0.01			-			-		
3		6		12:35pm Oct 19 - 1:40pm Oct 20	1505	2077	0.56	1.12	0.000539	<0.01	0.01	0.000005						
3		5		12:30pm Oct 19 - 1:35pm Oct 20	1535	2174	0.72	1.44	0.000662	0.04	0.08	0.000037						
3		4		12:10pm Oct 19 - 12:20pm Oct. 20	1450	2861	0.80	1.60	0.000559	<0.01	0.01	0.000003						
4		3		12:15pm Oct 19 - 12:25pm Oct 20	1450	2464	0.60	1.20	0.000487	0.04	0.08	0.000032						
Daily Calculations																		
min					1450	1910		0.49	0.00022518		0.01	0.000003						
max					1535	2861		1.60	0.00066232		0.08	0.000037						
median					1508	2249		1.16	0.00050176		0.02	0.000009						
mean					1496	2302		1.11	0.00047761		0.04	0.000016						
standard deviation					30	298		0.36	0.000135		0.03	0.000014						
Reference																		
		2		12:05pm Oct 19 - 1:15pm Oct 20	1510	2275	0.60	1.20	0.0005275	0.02	0.04	0.000018						
		1		11:40am Oct 19 - 12:55pm Oct 20	1515	2883	1.00	2.00	0.000694	<0.01	0.01	0.000003						
1		10	Oct 20-21/98	2:05pm Oct 20 - 2:20pm Oct 21	1455	2016	0.50	1.00	0.000496	0.01	0.02	0.000010						
2		9		2:00pm Oct 20 - 2:15pm Oct 21	1455	1863	0.72	1.44	0.000773	<0.01	0.01	0.000005						
2		8		1:45pm Oct 20 - 2:10pm Oct 21	1465	2454	0.48	0.96	0.000391	0.04	0.08	0.000033						
3		7		1:50pm Oct 20 - 1:55pm Oct 21	1445	2223	0.52	1.04	0.000468	<0.01	0.01	0.000004						
3		6		1:40pm Oct 20 - 1:50m Oct 21	1450	2021	0.46	0.92	0.000455	<0.01	0.01	0.000005						
3		5		1:35pm Oct 20 - 1:45pm Oct 21	1450	2154	0.52	1.04	0.000483	<0.01	0.01	0.000005						
3		4		12:20pm Oct 20 - 1:00pm Oct 21	1480	2973	0.64	1.28	0.000431	<0.01	0.01	0.000003						
4		3		12:25pm Oct 20 - 1:05pm Oct 21	1480	2515	0.54	1.08	0.000429	<0.01	0.01	0.000004						
Daily Calculations																		
min					1445	1863		0.92	0.00039123		0.01	0.000003						
max					1480	2973		1.44	0.00077287		0.08	0.000033						
median					1455	2189		1.04	0.00046142		0.01	0.000005						
mean					1460	2277		1.10	0.00049073		0.02	0.000009						
standard deviation					14	357		0.18	0.000119		0.02	0.000010						
Reference																		
		2		1:15pm Oct 20 - 12:55pm Oct 21	1420	2119	0.68	1.36	0.00064177	0.01	0.02	0.000009						
		1		12:50pm Oct 20 - 12:35pm Oct 21	1425	2737	0.58	1.16	0.000424	0.02	0.04	0.000015						
1		10	Oct 21-22/98	2:20pm Oct 21 - 3:25pm Oct 22	1505	2072	0.14	0.28	0.000135	0.01	0.02	0.000010						
2		9		2:15pm Oct 21 - 3:20pm Oct 22	1505	1831	0.20	0.40	0.000218	0.01	0.02	0.000011						
2		8		2:10pm Oct 21 - 2:55pm Oct 22	1485	2391	0.14	0.28	0.000117	0.03	0.06	0.000025						
3		7		1:55pm Oct 21 - 2:35pm Oct 22	1480	2168	0.18	0.36	0.000166	<0.01	0.01	0.000005						
3		6		1:50pm Oct 21 - 2:30pm Oct 22	1480	1989	0.24	0.48	0.000241	<0.01	0.01	0.000005						
3		5		1:40pm Oct 21 - 2:25pm Oct 22	1485	2155	0.22	0.44	0.000204	0.01	0.02	0.000009						
3		4		1:00pm Oct 21 - 1:55pm Oct 22	1495	2871	<0.02	0.02	0.000007	0.04	0.08	0.000028						
4		3		1:05pm Oct 21 - 2:15pm Oct 22	1510	2460	0.16	0.32	0.000130	0.02	0.04	0.000016						
Daily Calculations																		
min					1480	1831		0.02	6.966E-06		0.01	0.000005						
max					1510	2871		0.48	0.00024134		0.08	0.000028						
median					1490	2161		0.34	0.00015059		0.02	0.000010						
mean					1493	2242		0.32	0.00015241		0.03	0.000014						
standard deviation					12	325		0.14	0.000074		0.03	0.000009						
Reference																		
		2		12:55pm Oct 21 - 1:50pm Oct 22	1495	2167	0.20	0.40	0.00018455	0.01	0.02	0.000009						

Zone	Location #	Sample Date	Sample Time	Sample Period (min)	Volume of Air (m3)	Pb-210 Bq/ half filter	Pb-210 (Bq/filter)	Pb-210 Air Conc. Bq/m3	Ra-226 Bq/ half filter	Ra-226 (Bq/filter)	Ra-226 Air Conc. Bq/m3	Po-210 Bq/ half filter	Po-210 (Bq/filter)	Po-210 Air Conc. Bq/m3	Th-230 Bq/ half filter	Th-230 (Bq/filter)	Th-230 Air Conc. Bq/m3
						0 02			0 01			-			-		
RL	1		12 35pm Oct 21 - 1 35pm Oct 22	1500	2827	0 24	0 48	0 000170	<0 01	0 01	0 000004						
1	10	Oct 22-23/98	3 25pm Oct 22 - 2 10pm Oct 23	1365	1867	0 40	0 80	0 000428	<0 01	0 01	0 000005						
2	9		3 20pm Oct 22 - 2 05pm Oct 23	1365	1694	0 40	0 80	0 000472	0 01	0 02	0 000012						
2	8		2 55pm Oct 22 - 2 00pm Oct 23	1385	2219	0 42	0 84	0 000379	0 02	0 04	0 000018						
3	7		2 35pm Oct 22 - 1 30pm Oct 23	1375	2082	0 38	0 76	0 000365	0 02	0 04	0 000019						
3	6		2 30pm Oct 22 - 1 25pm Oct 23	1375	1838	0 36	0 72	0 000392	0 01	0 02	0 000011						
3	5		2 25pm Oct 22 - 1 05pm Oct 23	1360	1950	0 54	1 08	0 000554	0 01	0 02	0 000010						
3	4		1 55pm Oct 22 - 12 50pm Oct 23	1375	2520	0 76	1 52	0 000603	<0 01	0 01	0 000004						
4	3		2 15pm Oct 22 - 12 55pm Oct 23	1360	2240	0 62	1 24	0 000554	0 04	0 08	0 000036						
Daily Calculations																	
min				1360	1694		0 72	0 00036504		0 01	0 000004						
max				1385	2520		1 52	0 00060328		0 08	0 000036						
median				1370	2016		0 82	0 00045041		0 02	0 000011						
mean				1370	2051		0 97	0 00046837		0 03	0 000014						
standard deviation				9	268		0 29	0 000092		0 02	0 000010						
Reference																	
	2		1 50pm Oct 22 - 12 45pm Oct 23	1375	1993	0 58	1 16	0 00058191	0 02	0 04	0 000020						
	1		1 35pm Oct 22 12 35pm Oct 23	1380	2551	0 68	1 36	0 000533	0 02	0 04	0 000016						
1	10	Oct 23-24/98	2 10pm Oct 23 - 1 45pm Oct 24	1415	1899	1 18	2 36	0 001243	0 02	0 04	0 000021						
2	9		2 05pm Oct 23 - 1 30pm Oct 24	1405	1799	0 84	1 68	0 000934	0 03	0 06	0 000033						
2	8		2 00pm Oct 23 - 1 00pm Oct 24	1380	2178	1 90	3 80	0 001745	0 01	0 02	0 000009						
3	7		1 30pm Oct 23 - 12 55pm Oct 24	1405	2081	1 40	2 80	0 001345	<0 01	0 01	0 000005						
3	6		1 25pm Oct 23 - 12 45pm Oct 24	1420	1878	1 10	2 20	0 001172	<0 01	0 01	0 000005						
3	5		1 05pm Oct 23 - 12 40pm Oct 24	1415	1931	1 92	3 84	0 001989	0 01	0 02	0 000010						
3	4		12 50pm Oct 23 - 12 30pm Oct 24	1420	2602	2 30	4 60	0 001768	0 03	0 06	0 000023						
4	3		12 55pm Oct 23 12 35pm Oct 24	1420	2276	2 06	4 12	0 001810	<0 01	0 01	0 000004						
Daily Calculations																	
min				1380	1799		1 68	0 00093377		0 01	0 000004						
max				1420	2602		4 60	0 00198867		0 06	0 000033						
median				1415	2006		3 30	0 00154506		0 02	0 000010						
mean				1410	2080		3 16	0 00150064		0 03	0 000014						
standard deviation				14	266		1 05	0 000375		0 02	0 000011						
Reference																	
	2		12 45pm Oct 23 - 12 25pm Oct 24	1420	1978	2 32	4 64	0 00234577	0 02	0 04	0 000020						
	1		12 35pm Oct 23 10 45pm Oct 24	1330	2410	1 60	3 20	0 001328	<0 01	0 01	0 000004						
Overall (not including Reference values)																	
min				1360	1694		0 02	6 966E-06		0 01	0 000003		0 152	0 000062		0 028	0 000012
max				1603	3016		4 60	0 00198867		0 10	0 000048		0 218	0 000094		0 070	0 000030
median				1455	2186		1 00	0 00044285		0 02	0 000010		0 184	0 000079		0 048	0 000017
mean				1462	2246		1 33	0 00060152		0 03	0 000014		0 189	0 000078		0 047	0 000019
standard deviation				56	304		1 03	0 00046249		0 03	0 000011		0 024	0 000011		0 014	0 000006
QA/QC																	
Lab Duplicates																	

Zone	RL	Location #	Sample Date	o-210 q/filter)	Po-210 Air Conc. Bq/m3	Th-230 Bq/ half filter	Th-230 (Bq/filter)	Th-230 Air Conc. Bq/m3
	6628504	3	12:25pm O	.392				
	6628526	3	10:45am O	.516				
	6628537	7	9:20am O	.348				
	6657369	10	2:10pm O	.684				
	6657377	2	12:45pm O	.856				
	Field Blanks							
	6857366-FB			.040				
	6857301-FB			.030		0.024	0.048	
	6857315-FB							
	6857329-FB							
	6857348-FB							
	6628528-FB							
	Trip Blanks							
	6857361-TB							
	6857368-TB							

Note:

Less than RL

Laboratory reporting limit

Po210 results indicate activity on date an

Zone	Statistic	o-210 q/filter)	Po-210 Air Conc. Bq/m3	Th-230 Bq/ half filter	Th-230 (Bq/filter)	Th-230 Air Conc. Bq/m3
Zone 1	min					
	max					
	median					
	mean					
	standard deviation					
Zone 2	min	.152	7.27E-05	0.017	0.034	1.63E-05
	max	.214	8.28E-05	0.026	0.052	2.01E-05
	median	.183	7.78E-05	0.022	0.043	1.82E-05
	mean	.183	7.78E-05	0.022	0.043	1.82E-05
	standard deviation	.044	7.13E-06	0.006	0.013	2.73E-06
Zone 3	min	.178	6.17E-05	0.019	0.038	1.59E-05
	max	.218	9.45E-05	0.035	0.070	3.03E-05
	median	.197	8.50E-05	0.028	0.055	2.21E-05
	mean	.198	8.16E-05	0.027	0.055	2.26E-05
	standard deviation	.020	1.43E-05	0.007	0.013	6.94E-06
Zone 4	min					
	max					
	median					
	mean					
	standard deviation					

Zone		Location #	Sample Date	Sample Time	Sample Period (min)	Volume of Air (m3)	Pb-210 Bq/ half filter	Pb-210 (Bq/filter)	Pb-210 Air Conc Bq/m3	Ra-226 Bq/ half filter	Ra-226 (Bq/filter)	Ra-226 Air Conc. Bq/m3	Po-210 Bq/ half filter	Po-210 (Bq/filter)	Po-210 Air Conc. Bq/m3	Th-230 Bq/ hall filter	Th-230 (Bq/filter)	Th-230 Air Conc Bq/m3
	RL						0 02			0 01			-					
	6628504	3		12 25pm Oct 20 - 1 05pm Oct 21	1480	2515	0 61	1 22		0 03	0 06		0 20	0 392				
	6628526	3		10 45am Oct 16 - 11 15am Oct 17	1470	2460	0 81	1 62		0 07	0 15		0 26	0 516				
	6628537	7		9 20am Oct 15 - 11 05am Oct 16	1545	2390	0 52	1 04		0 02	0 04		0 17	0 348				
	6657369	10		2 10pm Oct 23 - 1 45pm Oct 24	1415	1899	1 28	2 56		0 03	0 05		0 34	0 684				
	6657377	2		12 45pm Oct 23 - 12 25pm Oct 24	1420	1978	1 44	2 89		0 05	0 10		0 43	0 856				
	Field Blanks																	
	6857366-FB						0 10	0 20		0 03	0 06		0 02	0 040				
	6857301-FB						< 0 01	0 01		0 09	0 18		0 015	0 030		0 024	0 048	
	6857315-FB						0 42	0 84		0 01	0 02							
	6857329 FB						0 14	0 28		0 01	0 02							
	6857348-FB						0 24	0 48		0 02	0 04							
	6628528-FB						<0 02	0 02		0 01	0 02							
	Trip Blanks																	
	6857361-TB						<0 02	0 02		0 03	0 06							
	6857368-TB						0 72	1 44		0 01	0 02							

Note

Less than RL

Laboratory reporting limit

Po210 results indicate activity on date analyzed

Zone		Sample Period (min)	Volume of Air (m3)	Pb-210 Bq/ half filter	Pb-210 (Bq/filter)	Pb-210 Air Conc Bq/m3	Ra-226 Bq/ half filter	Ra-226 (Bq/filter)	Ra-226 Air Conc. Bq/m3	Po-210 Bq/ half filter	Po-210 (Bq/filter)	Po-210 Air Conc. Bq/m3	Th-230 Bq/ hall filter	Th-230 (Bq/filter)	Th-230 Air Conc Bq/m3
Zone 1															
	min	1365	1867	0 140	0 280	1 35E-04	0 010	0 010	5 36E-06						
	max	1560	2243	1 180	2 360	1 24E-03	0 030	0 060	2 94E-05						
	median	1455	2057	0 390	0 780	3 84E-04	0 010	0 020	9 76E-06						
	mean	1461	2052	0 476	0 952	4 74E-04	0 016	0 029	1 41E-05						
	standard deviation	55	111	0 338	0 675	3 55E-04	0 009	0 018	8 70E-06						
Zone 2															
	min	1365	1694	0 100	0 200	1 04E-04	0 010	0 010	4 31E-06	0 076	0 152	7 27E 05	0 017	0 034	1 63E 05
	max	1558	2584	1 900	3 800	1 74E-03	0 040	0 080	4 14E-05	0 107	0 214	8 28E-05	0 026	0 052	2 01E-05
	median	1465	2134	0 480	0 960	4 68E-04	0 015	0 020	1 07E-05	0 092	0 183	7 78E-05	0 022	0 043	1 82E 05
	mean	1460	2131	0 615	1 229	5 82E-04	0 020	0 034	1 62E-05	0 092	0 183	7 78E-05	0 022	0 043	1 82E-05
	standard deviation	53	279	0 452	0 905	4 23E-04	0 012	0 025	1 21E-05	0 022	0 044	7 13E-06	0 006	0 013	2 73E-06
Zone 3															
	min	1360	1838	0 120	0 020	6 97E-06	0 010	0 010	3 36E-06	0 089	0 178	6 17E-05	0 019	0 038	1 59E-05
	max	1603	3016	2 300	4 600	1 99E-03	0 050	0 100	4 79E-05	0 109	0 218	9 45E-05	0 035	0 070	3 03E 05
	median	1453	2186	0 520	1 040	4 43E-04	0 015	0 020	8 73E-06	0 099	0 197	8 50E-05	0 028	0 055	2 21E-05
	mean	1465	2302	0 727	1 418	6 28E-04	0 021	0 029	1 26E-05	0 099	0 198	8 16E-05	0 027	0 055	2 26E-05
	standard deviation	59	337	0 532	1 074	4 83E-04	0 013	0 026	1 09E-05	0 010	0 020	1 43E-05	0 007	0 013	6 94E-06
Zone 4															
	min	1360	2240	0 160	0 320	1 30E-04	0 010	0 010	3 98E-06						
	max	1550	2661	2 060	4 120	1 81E-03	0 040	0 080	3 57E-05						
	median	1450	2460	0 570	1 140	4 58E-04	0 025	0 040	1 63E-05						
	mean	1456	2442	0 793	1 586	6 61E-04	0 026	0 044	1 82E-05						
	standard deviation	52	119	0 675	1 349	5 79E-04	0 013	0 029	1 24E-05						

Appendix D.4: Metal Analysis of Dust on Roads and Exterior Surfaces

Sample media Dust **Road Dust** Exterior Surface Dust

Location	Description	Road Dust Cobalt µg/100cm²	Road Dust Lead µg/100cm²	Road Dust Nickel µg/100cm²	Road Dust Silver µg/100cm²	Road Dust Arsenic µg/100cm²	Road Dust Uranium µg/100cm²	Description	Exterior Surface Dust Cobalt µg/100cm²	Exterior Surface Dust Lead µg/100cm²	Exterior Surface Dust Nickel µg/100cm²	Exterior Surface Dust Silver µg/100cm²	Exterior Surface Dust Arsenic µg/100cm²	Exterior Surface Dust Uranium µg/100cm²
RL		0 75	5 0	0 50	0 75	0 25	5 0		0 75	5 0	0 50	0 75	0 25	5 0
3	paved road	1 6	11	16	<	3 1	6 5	road sign	<	51	1 2	<	2 0	<
4	paved road	1 1	5 0	19	<	2 5	<	road sign	4 8	350	<	<	<	<
5	paved road	6 0	8 5	15	<	16	9 3	road sign	<	<	<	<	<	<
6*	dirt road	86	110	57	<	220	73	shed	<	1700	5 9	<	83	<
7	paved road	1 9	3 9	5	<	1 9	<	mailbox	<	54	0 84	<	<	<
8	paved road	<	<	1 8	<	0 38	<	mailbox	3 7	680	15	<	0 97	<
9	paved road	2 8	9 2	12	<	8 8	<	road sign	<	9 8	<	<	<	<
10	paved road	0 91	11	4 8	<	1 6	6 2	road sign	<	530	2 8	<	12	<
Min		0 38	2 5	1 8	0 38	0 38	2 5		0 38	2 5	0 25	0 38	0 13	2 5
Max		6	11	19	0 38	16	9 3		4 8	1700	15	0 38	83	2 5
Median		1 6	8 5	12	0 38	2 5	2 5		0 38	202	1 02	0 38	0 55	2 5
Mean		2 1	7 3	10 5	0 38	4 9	4 57		1 34	422 2	3 31	0 38	12 31	2 5
Standard deviation		1 89	3 47	6 63	0 0	5 59	2 77		1 82	577 6	5 10	0 0	28 85	0 0
Reference														
1	paved road	3 0	26	13	<	1 0	11	road sign	<	7 2	0 70	<	<	<
2	paved road	<	6 7	7 9	<	0 84	<	road sign	1 1	920	1 7	<	<	<
QA/QC														
TRIP BLANKS														
Trip Blank		<	<	<	<	<	<							
LAB DUPLICATES														
1	paved road	2 7	25	12	<	0 52	<							
10	paved road	<	12	4 6	<	<	<	road sign	<	500	2 8	<	11	<
5								road sign	<	<	<	<	<	<

Note: RL Laboratory reporting limit
< Less than laboratory reporting limit
Statistical calculations use 0 5*RL when value < RL
* Location 6 road dust values removed from statistical calculations and Reference comparison

Appendix D.5: Road and Exterior Surface Dust Analyzed for Radionuclides

		Road Dust					Exterior Surface Dust			
Location	Description	Po-210 Bq/100cm^2	Pb-210 Bq/100cm^2	Th-230 Bq/100cm^2	Ra-226 Bq/100cm^2	Description	Po-210 Bq/100cm^2	Pb-210 Bq/100cm^2	Th-230 Bq/100cm^2	Ra-226 Bq/100cm^2
RL		-	-	0.01	-		0.01		-	0.01
3	paved road	0.04	0.03	0.01	0.01	road sign	0.76	0.54	< 0.01	< 0.01
4	paved road	0.02	<0.01	<0.01	0.01	road sign	0.01	3.60	< 0.01	< 0.01
5	paved road	0.05	0.09	0.03	0.02	road sign	< 0.01	<0.03	< 0.01	< 0.01
*6	dirt road	0.17	0.06	0.03	0.10	shed	1.65	1.59	< 0.01	< 0.01
7	paved road	0.02	<0.02	0.05	0.01	mailbox	0.02	0.02	< 0.02	< 0.01
8	paved road	0.06	0.20	0.01	0.01	mailbox	0.74	1.26	< 0.01	< 0.01
9	paved road	0.06	<0.04	0.03	0.02	road sign	0.06	<0.01	< 0.01	0.02
10	paved road	0.06	0.11	0.01	0.01	road sign	1.56	2.39	< 0.01	< 0.01
Min		0.02	0.005	0.005	0.01		0.005	0.005	0.005	0.005
Max		0.06	0.2	0.05	0.02		1.65	3.6	0.01	0.02
Median		0.05	0.03	0.01	0.01		0.4	0.9	0.005	0.005
Mean		0.044	0.066	0.021	0.013		0.601	1.178	0.006	0.007
Standard deviation		0.018	0.072	0.016	0.005		0.697	1.309	0.002	0.005
Reference										
1	paved road	0.04	<0.02	0.01	0.01	road sign	0.07	<0.01	< 0.01	< 0.01
2	paved road	0.03	0.04	0.02	0.01	road sign	0.10	0.12	< 0.01	0.01

Note:

RL — Laboratory reporting limit
ug/sample — micrograms per sample
Min, max, average, and std. dev. use 0.5*RL when value < RL
< — Less than RL
*Location 6 road dust values removed from statistical calculations and Reference comparison
Po210 results indicate activity on date analyzed

Appendix D.7: Outdoor Dustfall Samples Analyzed for Radionuclides

	Study ID	Sample Date	Number of Days	Po-210		Pb-210		Th-230		Ra-226	
				Bq/container	Bq/100cm2 /30 days	Bq/container	Bq/100cm2 /30 days	Bq/container	Bq/100cm2 /30 days	Bq/container	Bq/100cm2 /30 days
RL				0 02		0 08		0.04		0.02	
	5	Oct.8 -Nov. 7	30	0.03	0.016	0.09	0 049	< 0 04	0.011	< 0 02	0 005
	6	Oct.8 -Nov. 7	30	0 03	0 016	< 0 08	0 022	< 0 04	0 011	< 0 02	0 005
	3	Oct.8 -Nov. 7	30	< 0 02	0.005	< 0 08	0.022	< 0.04	0.011	< 0 02	0 005
	7	Oct.8 -Nov. 7	30	0.03	0.016	0.09	0.049	< 0.04	0.011	< 0.02	0 005
	8	Oct.8 -Nov. 7	30	< 0.02	0.005	< 0.08	0.022	< 0.04	0.011	< 0 02	0.005
	9	Oct.8 -Nov. 7	30	< 0.02	0.005	0 10	0.055	< 0.04	0 011	< 0 02	0 005
	10	Oct.8 -Nov. 7	30	< 0.02	0 005	< 0 08	0.022	< 0 04	0.011	< 0.02	0 005
	4	Oct.8 -Nov. 7	30	0 02	0 011	< 0.08	0.022	< 0.04	0.011	< 0.02	0.005
Min				0 01	0.005	0.04	0 022	0 02	0.011	0 01	0 005
Max				0.03	0 016	0 1	0.055	0 02	0 011	0.01	0 005
Median				0 015	0 008	0 04	0.022	0 02	0 011	0.01	0 005
Mean				0.019	0 0103	0 06	0 033	0.02	0 011	0.01	0 005
Standard Deviation				0 010	0 0054	0 028	0.015	0.0	0 0	0.0	0 0
Reference											
	1	Oct.8 -Nov. 7	30	< 0.02	0.005	< 0 08	0.022	< 0 04	0 011	< 0 02	0 005
	2	Oct.8 -Nov. 7	30	< 0.02	0 005	< 0 08	0 022	< 0 04	0.011	< 0 02	0 005
QA/QC											
Blanks											
BLANK C				< 0 02		< 0.08		< 0.04		0 02	

Note:

RL Reporting Limit

0 5*RL used for calculations when value less than RL

BLANK C Clean container wash

Dustfall was collected in either plastic containers or plastics bags After the dustfall period, these were cleansed with water, washing all dust into another container which was sent to the lab for analysis

< Less than laboratory RL

Po210 results indicate activity on date analyzed

Appendix D.6: Outdoor Dustfall Samples analyzed for Metals

	Location Number	Sample Date	Number of Days	Cobalt		Lead		Nickel		Silver		Arsenic		Uranium	
				ug/container	ug/100cm2 /30 days	ug/container	ug/100cm2 /30 days	ug/container	ug/100cm2 /30 days	ug/container	ug/100cm2 /30 days	ug/container	ug/100cm2 /30 days	ug/container	ug/100cm2 /30 days
RL				0 75		5 0		0 50		0 75		0 25		5 0	
	3	Oct.8 -Nov 7	30	<2 0	0 55	<13	3 57	<1 3	0 36	<2 0	0 55	2 9	1 59	<13	3 57
	4	Oct.8 -Nov 7	30	<1 5	0 41	<10	2 74	<1 0	0 27	<1 5	0 41	<0 50	0 14	<10	2 74
	5	Oct 8 -Nov 7	30	<2 0	0 55	<13	3 57	<1 3	0 36	<2 0	0 55	1 2	0 66	<13	3 57
	10	Oct.8 -Nov. 7	30	<4 7	1 29	<32	8 78	<3 2	0 88	<4 7	1 29	<1 5	0 41	<32	8 78
	7	Oct 8 -Nov. 7	30	<6 0	1 65	<40	10 97	<4 0	1 10	<6 0	1 65	<2 0	0 55	<40	10 97
	8	Oct.8 -Nov. 7	30	<4 6	1 26	<31	8 50	<3 1	0 85	<4 6	1 26	<1 5	0 41	<31	8 50
	6	Oct.8 -Nov. 7	30	<8 0	2 19	<53	14 54	<5 3	1 45	<8 0	2 19	<2 6	0 71	<53	14 54
	9	Oct 8 -Nov. 7	30	<6 8	1 87	<45	12 34	<4 5	1 23	<6 8	1 87	<2 3	0 63	<45	12 34
Reference															
	1	Oct 8 -Nov. 7	30	<3 1	0 85	<21	5 76	<2 1	0 58	<3 1	0 85	<1 1	0 30	<21	5 76
	2	Oct 8 -Nov. 7	30	<4 3	1 18	<28	7 68	<2 8	0 77	<4 3	1 18	<1 4	0 38	<28	7 68
min				0 75	0 41	5	2 74	0 5	0 27	0 75	0 41	0 25	0 14	5	2 74
max				4	2 19	26 5	14 54	2 65	1 45	4	2 19	2 9	1 59	26 5	14 54
mean				2 23	1 22	14 81	8 13	1 48	0 81	2 23	1 22	1 16	0 64	14 81	8 13
median				2 33	1 28	15 75	8 64	1 575	0 86	2 325	1 28	1 075	0 59	15 75	8 64
standard deviation				1 21	0 67	8 10	4 44	0 81	0 44	1 21	0 67	0 78	0 43	8 10	4 44
QA/QC															
BLANKS															
BLANK-C				<1 5		<10		<1 0		<1 5		<0 50		<10	
BLANK-W				<5 0		<33		<3 3		<5 0		<1 7		<33	
LAB DUPLICATES															
	7			<6 0		<40		<4 0		<6 0		<2 0		<40	
Criteria															
AAQC							1000								

RL Reporting Limit
0 5 * RL used for statistical calcs
BLANK C Clean container wash
BLANK W Clean bag wash
Dustfall was collected in either plastic containers or plastics bags After the dustfall period, these were cleansed with water, washing all dust into another container which was sent to the lab for analysis
Lead Dustfall Criteria from Ontario Regulation 337 Ambient Air Quality Criteria

Appendix D.8: Indoor Air Samples Analyzed for Metals

	House ID	Description	Sample	Arsenic Filter Conc. ug/filter	Arsenic Air Conc. µg/m3	Arsenic House Average ug/m3	Uranium Filter Conc. ug/filter	Uranium Air Conc. µg/m3	Uranium House Average ug/m3
RL				25			5 0		
	bz	IA1-Front Entranceway	Oct	<	0 022	0 02	<	0 433	0 43
		IA2-Kitchen	Oct	<	0 022		<	0 433	
	v	IA1-Kitchen	Oct	<	0 024	0 02	<	0 475	0 48
		IA2-Living Room	Oct	<	0 024		<	0 475	
	by	IA1-Living Room	Oct	<	0 024	0 02	<	0 474	0 47
		IA2- Dining Room	Oct	<	0 024		<	0 474	
	x	IA1-Kitchen	Oct	<	0 033	0 03	<	0 670	0 53
		IA2-Living Room (Entranceway)	Oct	<	0 019		<	0 389	
	y	IA1-Living Room	Oct	<	0 024	0 02	<	0 475	0 48
		IA2-Kitchen	Oct	<	0 024		<	0 479	
	z	IA1-Kitchen (entranceway)	Oct	<	0 026	0 03	<	0 517	0 52
		IA2-Dining Room	Oct	<	0 026		<	0 517	
	aa	IA1-Living Room	Oct	<	0 023	0 03	<	0 463	0 51
		IA2-Kitchen	Oct	<	0 027		<	0 549	
	ac	IA1-Kitchen (entranceway)	Oct	<	0 024	0 02	<	0 473	0 47
		IA2-Living Room	Oct	<	0 023		<	0 469	
	g	IA1-Library	Oct	<	0 024	0 02	<	0 480	0 48
		IA2-Hall Kitchen	Oct	<	0 024		<	0 480	
	ae	IA1-Laundry Area (main fl)	Oct	<	0 023	0 02	<	0 468	0 47
		IA2-Living Room (entranceway)	Oct	<	0 023		<	0 466	
	af	IA1-Dining Room	Oct	<	0 014	0 02	<	0 290	0 36
		IA2-Entranceway/Play Area	Oct	<	0 021		<	0 421	
	ag	IA1-Living Room (entranceway)	Oct	<	0 024	0 02	<	0 474	0 47
		IA2-Kitchen	Oct	<	0 024		<	0 476	
	h	IA1-Second Level Bedroom	Oct	<	0 022	0 02	<	0 447	0 46
		IA2-Main Level Store (vacant)	Oct	<	0 023		<	0 469	
	ah	IA1-Kitchen (Entranceway)	Oct	<	0 021	0 02	<	0 419	0 44
		IA2-Dining Room	Oct	<	0 023		<	0 467	
	ai	IA1-Living Room (entranceway)	Oct	<	0 024	0 02	<	0 473	0 47
		IA2-Dining Room	Oct	<	0 024		<	0 472	
	ak	IA1-Living Room (entranceway)	Oct	<	0 024	0 02	<	0 484	0 49
		IA2-Dining Room	Oct.	<	0 025		<	0 502	
	al	IA1-Living Room	Oct	<	0 023	0 02	<	0 467	0 49
		IA2-Kitchen	Oct	<	0 026		<	0 520	
	am	IA1-Living Room	Oct.	<	0 024	0 02	<	0 479	0 48
		IA2-Kitchen	Oct	<	0 024		<	0 478	
	an	IA1-Family Room	Oct	<	0 024	0 02	<	0 480	0 45
		IA2-Living Room	Oct	<	0 021		<	0 428	
	ao	IA1-Kitchen	Oct.	<	0 024	0 02	<	0 477	0 49
		IA2-Living Room	Oct	<	0 025		<	0 503	
	ap	IA1-Kitchen (Entranceway)	Oct	<	0 018	0 02	<	0 368	0 42
		IA2-Living Room	Oct	<	0 024		<	0 476	
	aq	IA1-Rear Entranceway	Oct	<	0 024	0 02	<	0 474	0 47
		IA2-Kitchen	Oct	<	0 024		<	0 474	
	ar	IA1-Front Entranceway	Oct	<	0 023	0 02	<	0 463	0 46
		IA2-Rear Entranceway	Oct	<	0 023		<	0 465	
	at	IA1-Rear Entranceway	Oct	<	0 024	0 02	<	0 478	0 48
		IA2-Kitchen	Oct	<	0 024		<	0 478	
	au	IA1-Kitchen (entranceway)	Oct	<	0 023	0 02	<	0 461	0 46
		IA2-Living Room	Oct	<	0 023		<	0 461	
	c	IA1-Living Room	Oct	<	0 023	0 02	<	0 463	0 46
		IA2-Kitchen	Oct	<	0 023		<	0 464	
	av	IA1-Kitchen	Oct	<	0 023	0 02	<	0 467	0 46
		IA2-Living Room/Entranceway	Oct	<	0 022		<	0 446	

Appendix D 8: Indoor Air Samples Analyzed for Metals

RL / House ID	Description	Sample Date	Flow (lpm)	Sample Time (min)	Volume of Air (m3)	Cobalt Filter Conc. ug/filter 0.75	Cobalt Air Conc. µg/m3	Cobalt House Average ug/m3	Lead Filter Conc. ug/filter 5.0	Lead Air Conc. µg/m3	Lead House Average ug/m3	Nickel Filter Conc ug/filter 0.50	Nickel Air Conc. µg/m3	Nickel House Average ug/m3	Silver Filter Conc ug/filter 0.75	Silver Air Conc. µg/m3	Silver House Average ug/m3	Arsenic Filter Conc ug/filter 0.25	Arsenic Air Conc µg/m3	Arsenic House Average ug/m3	Uranium Filter Conc. ug/filter 5.0	Uranium Air Conc. µg/m3	Uranium House Average ug/m3
bz	IA1 Front Entranceway	Oct 20	15	385	5.8	<	0.065	0.06	<	0.433	0.43	<	0.043	0.04	<	0.065	0.06	<	0.022	0.02	<	0.433	0.43
	IA2-Kitchen	Oct 20	15	385	5.8	<	0.065		<	0.433		<	0.043		<	0.065		<	0.022		<	0.433	
v	IA1-Kitchen	Oct 21 - 22	3.1	1697	5.3	<	0.071	0.07	<	0.475	0.48	<	0.048	0.05	<	0.071	0.07	<	0.024	0.02	<	0.475	0.48
	IA2 Living Room	Oct 21 - 22	3.1	1697	5.3	<	0.071		<	0.475		<	0.048		<	0.071		<	0.024		<	0.475	
by	IA1-Living Room	Oct 13 - 14	3.1	1700	5.3	<	0.071	0.07	<	0.474	0.47	<	0.047	0.05	<	0.071	0.07	<	0.024	0.02	<	0.474	0.47
	IA2- Dining Room	Oct 13 - 14	3.1	1700	5.3	<	0.071		<	0.474		<	0.047		<	0.071		<	0.024		<	0.474	
x	IA1 Kitchen	Oct 8 - 9	3.7, 3.1	40, 1156	3.7	<	0.100	0.08	<	0.670	0.53	<	0.067	0.05	<	0.100	0.08	<	0.033	0.03	<	0.670	0.53
	IA2 Living Room (Entranceway)	Oct 8 - 9	3.7, 3.1	64, 1995	6.4	<	0.058		<	0.389		<	0.039		<	0.058		<	0.019		<	0.389	
y	IA1-Living Room	Oct 22 - 23	3.1	1698	5.3	<	0.071	0.07	<	0.475	0.48	<	0.047	0.05	<	0.071	0.07	<	0.024	0.02	<	0.475	0.48
	IA2 Kitchen	Oct 22 - 23	3.1	1683	5.2	<	0.072		<	0.479		<	0.048		<	0.072		<	0.024		<	0.479	
z	IA1 Kitchen (entranceway)	Oct 13 - 14	3.7	1308	4.8	<	0.077	0.08	<	0.517	0.52	<	0.052	0.05	<	0.077	0.08	<	0.026	0.03	<	0.517	0.52
	IA2-Dining Room	Oct 13 - 14	3.7	1308	4.8	<	0.077		<	0.517		<	0.052		<	0.077		<	0.026		<	0.517	
aa	IA1 Living Room	Oct 8 - 9	3.1	1740	5.4	<	0.070	0.08	<	0.463	0.51	<	0.046	0.05	<	0.070	0.08	<	0.023	0.03	<	0.463	0.51
	IA2 Kitchen	Oct 8 - 9	3.1	1470	4.6	<	0.082		<	0.549		<	0.055		<	0.082		<	0.027		<	0.549	
ac	IA1-Kitchen (entranceway)	Oct 24	15	352	5.3	<	0.071	0.07	<	0.473	0.47	<	0.047	0.05	<	0.071	0.07	<	0.024	0.02	<	0.473	0.47
	IA2 Living Room	Oct 24	15	355	5.3	<	0.070		<	0.469		<	0.047		<	0.070		<	0.023		<	0.469	
g	IA1 Library	Oct 13 - 14	3.1	1680	5.2	<	0.072	0.07	<	0.480	0.48	<	0.048	0.05	<	0.072	0.07	<	0.024	0.02	<	0.480	0.48
	IA2 Hall Kitchen	Oct 13 - 14	3.1	1680	5.2	<	0.072		<	0.480		<	0.048		<	0.072		<	0.024		<	0.480	
ae	IA1 Laundry Area (main fl.)	Oct 19 - 20	3.1	1722	5.3	<	0.070	0.07	<	0.468	0.47	<	0.047	0.05	<	0.070	0.07	<	0.023	0.02	<	0.468	0.47
	IA2 Living Room (entranceway)	Oct 19 - 20	3.1	1730	5.4	<	0.070		<	0.466		<	0.047		<	0.070		<	0.023		<	0.466	
af	IA1 Dining Room	Oct 13 - 15	3.1	2785	8.6	<	0.043	0.05	<	0.290	0.36	<	0.029	0.04	<	0.043	0.05	<	0.014	0.02	<	0.290	0.36
	IA2 Entranceway/Play Area	Oct 13 - 15	3.1	1914	5.9	<	0.063		<	0.421		<	0.042		<	0.063		<	0.021		<	0.421	
ag	IA1-Living Room (entranceway)	Oct 20 - 21	3.1	1701	5.3	<	0.071	0.07	<	0.474	0.47	<	0.047	0.05	<	0.071	0.07	<	0.024	0.02	<	0.474	0.47
	IA2-Kitchen	Oct 20 - 21	3.1	1696	5.3	<	0.071		<	0.476		<	0.048		<	0.071		<	0.024		<	0.476	
h	IA1 Second Level Bedroom	Oct 20 - 21	3.1	1803	5.6	<	0.067	0.07	<	0.447	0.46	<	0.045	0.05	<	0.067	0.07	<	0.022	0.02	<	0.447	0.46
	IA2-Main Level Store (vacant)	Oct 20 - 22	3.1	1718	5.3	<	0.070		<	0.469		<	0.047		<	0.070		<	0.023		<	0.469	
ah	IA1 Kitchen (Entranceway)	Oct 19 - 20	3.1	1923	6.0	<	0.063	0.07	<	0.419	0.44	<	0.042	0.04	<	0.063	0.07	<	0.021	0.02	<	0.419	0.44
	IA2-Dining Room	Oct 19 - 20	3.1	1728	5.4	<	0.070		<	0.467		<	0.047		<	0.070		<	0.023		<	0.467	
ai	IA1 Living Room (entranceway)	Oct 20 - 21	3.1	1705	5.3	<	0.071	0.07	<	0.473	0.47	<	0.047	0.05	<	0.071	0.07	<	0.024	0.02	<	0.473	0.47
	IA2-Dining Room	Oct 20 - 21	3.1	1710	5.3	<	0.071		<	0.472		<	0.047		<	0.071		<	0.024		<	0.472	
ak	IA1 Living Room (entranceway)	Oct 19 - 20	3.1	1666	5.2	<	0.073	0.07	<	0.484	0.49	<	0.048	0.05	<	0.073	0.07	<	0.024	0.02	<	0.484	0.49
	IA2-Dining Room	Oct 19 - 20	3.1	1608	5.0	<	0.075		<	0.502		<	0.050		<	0.075		<	0.025		<	0.502	
al	IA1-Living Room	Oct 8 - 9	3.1	1727	5.4	<	0.070	0.07	<	0.467	0.49	<	0.047	0.05	<	0.070	0.07	<	0.023	0.02	<	0.467	0.49
	IA2 Kitchen	Oct 8 - 10	3.1	1552	4.8	<	0.078		<	0.520		<	0.052		<	0.078		<	0.026		<	0.520	
am	IA1-Living Room	Oct 15 - 16	3.1	1684	5.2	<	0.072	0.07	<	0.479	0.48	<	0.048	0.05	<	0.072	0.07	<	0.024	0.02	<	0.479	0.48
	IA2 Kitchen	Oct 15 - 16	3.1	1686	5.2	<	0.072		<	0.478		<	0.048		<	0.072		<	0.024		<	0.478	
an	IA1 Family Room	Oct 8 - 9	3.1	1681	5.2	<	0.072	0.07	<	0.480	0.45	2.1	0.403	0.22	<	0.072	0.07	<	0.024	0.02	<	0.480	0.45
	IA2-Living Room	Oct 8 - 10	3.1	1885	5.8	<	0.064		<	0.428		<	0.043		<	0.064		<	0.021		<	0.428	
ao	IA1-Kitchen	Oct 13 - 15	3.1	1692	5.2	<	0.071	0.07	<	0.477	0.49	<	0.048	0.05	<	0.071	0.07	<	0.024	0.02	<	0.477	0.49
	IA2 Living Room	Oct 13 - 15	3.1	1602	5.0	<	0.076		<	0.503		<	0.050		<	0.076		<	0.025		<	0.503	
ap	IA1 Kitchen (Entranceway)	Oct 22 - 23	3.1	2192	6.8	<	0.055	0.06	<	0.368	0.42	<	0.037	0.04	<	0.055	0.06	<	0.018	0.02	<	0.368	0.42
	IA2 Living Room	Oct 22 - 24	3.1	1695	5.3	<	0.071		<	0.476		<	0.048		<	0.071		<	0.024		<	0.476	
aq	IA1 Rear Entranceway	Oct 19 - 20	3.1	1700	5.3	<	0.071	0.07	<	0.474	0.47	<	0.047	0.05	<	0.071	0.07	<	0.024	0.02	<	0.474	0.47
	IA2-Kitchen	Oct 19 - 20	3.1	1700	5.3	<	0.071		<	0.474		<	0.047		<	0.071		<	0.024		<	0.474	
ar	IA1 Front Entranceway	Oct 19 - 20	3.1	1740	5.4	<	0.070	0.07	<	0.463	0.46	<	0.046	0.05	<	0.070	0.07	<	0.023	0.02	<	0.463	0.46
	IA2 Rear Entranceway	Oct 19 - 20	3.1	1735	5.4	<	0.070		<	0.465		<	0.046		<	0.070			0.023		<	0.465	
at	IA1-Rear Entranceway	Oct 23 - 24	3.1	1687	5.2	<	0.072	0.07	<	0.478	0.48	<	0.048	0.05	<	0.072	0.07	<	0.024	0.02	<	0.478	0.48
	IA2 Kitchen	Oct 23 - 24	3.1	1687	5.2	<	0.072		<	0.478		<	0.048		<	0.072		<	0.024		<	0.478	
au	IA1 Kitchen (entranceway)	Oct 24 - 25	3.1	1748	5.4	<	0.069	0.07	<	0.461	0.46	<	0.046	0.05	<	0.069	0.07	<	0.023	0.02	<	0.461	0.46
	IA2 Living Room	Oct 24 - 25	3.1	1748	5.4	<	0.069		<	0.461		<	0.046		<	0.069		<	0.023		<	0.461	
c	IA1-Living Room	Oct 8 - 9	3.1	1740	5.4	<	0.070	0.07	<	0.463	0.46	<	0.046	0.05	<	0.070	0.07	<	0.023	0.02	<	0.463	0.46
	IA2 Kitchen	Oct 8 - 9	3.1	1737	5.4	<	0.070		<	0.464		<	0.046		<	0.070		<	0.023		<	0.464	
av	IA1 Kitchen	Oct 13 - 14	3.1	1727	5.4	<	0.070	0.07	<	0.467	0.46	<	0.047	0.05	<	0.070	0.07		0.023	0.02	<	0.467	0.46
	IA2 Living Room/Entranceway	Oct 13 - 15	3.1	1809	5.6	<	0.067		<	0.446		<	0.045		<	0.067			0.022		<	0.446	

Appendix D 8 Indoor Air Samples Analyzed for Metals

House ID	Description	Sample Date	Flow (lpm)	Sample Time (min)	Volume of Air (m3)	Cobalt Filter Conc ug/filter	Cobalt Air Conc µg/m3	Cobalt House Average ug/m3	Lead Filter Conc ug/filter	Lead Air Conc µg/m3	Lead House Average ug/m3	Nickel Filter Conc ug/filter	Nickel Air Conc µg/m3	Nickel House Average ug/m3	Silver Filter Conc ug/filter	Silver Air Conc. µg/m3	Silver House Average ug/m3	Arsenic Filter Conc ug/filter	Arsenic Air Conc. µg/m3	Arsenic House Average ug/m3	Uranium Filter Conc ug/filter	Uranium Air Conc µg/m3	Uranium House Average ug/m3
RL						0.75			5.0			0.50			0.75			0.25			5.0		
ax	IA1 Dining Room (Entranceway)	Oct 21 - 22	3.1	1800	5.6	<	0.067	0.07	<	0.448	0.46	<	0.045	0.05	<	0.067	0.07	<	0.022	0.02	<	0.448	0.46
	IA2 Living Room	Oct 21 - 22	3.1	1721	5.3	<	0.070		<	0.469		<	0.047		<	0.070		<	0.023		<	0.469	
ay	IA1 Living Room	Oct 21 - 22	3.1	1734	5.4	<	0.070	0.07	<	0.465	0.47	<	0.047	0.05	<	0.070	0.07	<	0.023	0.02	<	0.465	0.47
	IA2 Entranceway	Oct 21 - 23	3.1	1706	5.3	<	0.071		<	0.473		<	0.047		<	0.071		<	0.024		<	0.473	
az	IA1 Living Room (Entranceway)	Oct 23 - 24	3.1	1681	5.2	<	0.072	0.07	<	0.480	0.48	<	0.048	0.05	<	0.072	0.07	<	0.024	0.02	<	0.480	0.48
	IA2 Dining Room	Oct 23 - 24	3.1	1681	5.2	<	0.072		<	0.480		<	0.048		<	0.072		<	0.024		<	0.480	
bb	IA1 Kitchen (Entranceway)	Oct 14 - 15	3.1	1685	5.2	<	0.072	0.07	<	0.479	0.48	<	0.048	0.05	<	0.072	0.07	<	0.024	0.02	<	0.479	0.48
	IA2 Living Room	Oct 14 - 15	3.1	1685	5.2	<	0.072		<	0.479		<	0.048		<	0.072		<	0.024		<	0.479	
bf	IA1 Kitchen (Entranceway)	Oct 23	15	540	8.1	<	0.046	0.05	<	0.309	0.31	<	0.031	0.03	<	0.046	0.05	<	0.015	0.02	<	0.309	0.31
	IA2 Living Room	Oct 23	15	540	8.1	<	0.046		<	0.309		<	0.031		<	0.046		<	0.015		<	0.309	
p	IA1 Playroom/Entranceway	Oct 23 - 24	3.1	1295	4.0	<	0.093	0.08	<	0.623	0.54	<	0.062	0.05	<	0.093	0.08	<	0.031	0.03	<	0.623	0.54
	IA2 Living Room	Oct 23 - 24	3.1	1795	5.6	<	0.067		<	0.449		<	0.045		<	0.067		<	0.022		<	0.449	
bh	IA1 Kitchen (entranceway)	Oct 21 - 22	3.1	1683	5.2	<	0.072	0.07	<	0.479	0.48	<	0.048	0.05	<	0.072	0.07	<	0.024	0.02	<	0.479	0.48
	IA2 Living Room	Oct 21 - 23	3.1	1710	5.3	<	0.071		<	0.472		<	0.047		<	0.071		<	0.024		<	0.472	
bi	IA1 Entranceway	Oct 14 - 15	3.7	1448	5.4	<	0.070	0.07	<	0.467	0.46	<	0.047	0.05	<	0.070	0.07	<	0.023	0.02	<	0.467	0.46
	IA2 Living Room	Oct 14 - 15	3.7	1460	5.4	<	0.069		<	0.463		<	0.046		<	0.069		<	0.023		<	0.463	
e	IA1 Off Dining Room	Oct 22 - 23, 26	3.1	1912	5.9	<	0.063	0.07	<	0.422	0.47	<	0.042	0.05	<	0.063	0.07	<	0.021	0.02	<	0.422	0.47
	IA2 Kitchen/Laundry Room	Oct 22 - 23, 26	3.1	1573	4.9	<	0.077		<	0.513		<	0.051		<	0.077		<	0.026		<	0.513	
q	IA1 Kitchen (entranceway)	Oct 13 - 14	3.1	1715	5.3	<	0.071	0.07	<	0.470	0.47	<	0.047	0.05	<	0.071	0.07	<	0.024	0.02	<	0.470	0.47
	IA 2 Living Room	Oct 13 - 14	3.1	1710	5.3	<	0.071		<	0.472		<	0.047		<	0.071		<	0.024		<	0.472	
bj	IA1 Front Entranceway	Oct 19 - 20	3.1	2424	7.5	<	0.050	0.06	<	0.333	0.40	<	0.033	0.04	<	0.050	0.06	<	0.017	0.02	<	0.333	0.40
	IA2 Living Room	Oct 19 - 20	3.1	1747	5.4	<	0.069		<	0.462		<	0.046		<	0.069		<	0.023		<	0.462	
bl	IA1 Rear Entranceway	Oct 19 - 20	3.1	1371	4.3	<	0.088	0.08	<	0.588	0.53	<	0.059	0.05	<	0.088	0.08	<	0.029	0.03	<	0.588	0.53
	IA2 Upstairs Bedroom	Oct 19 - 20	3.1	1674	5.2	<	0.072		<	0.482		<	0.048		<	0.072		<	0.024		<	0.482	
bm	IA1 Entranceway	Oct 15 - 16	3.1	1685	5.2	<	0.072	0.07	<	0.479	0.48	<	0.048	0.05	<	0.072	0.07	<	0.024	0.02	<	0.479	0.48
	IA2 Living Room	Oct 15 - 16	3.1	1687	5.2	<	0.072		<	0.478		<	0.048		<	0.072		<	0.024		<	0.478	
bn	IA1 Kitchen	Oct 13 - 14	3.1	1901	5.9	<	0.064	0.07	<	0.424	0.45	<	0.042	0.05	<	0.064	0.07	<	0.021	0.02	<	0.424	0.45
	IA2 Living Room	Oct 13 - 15	3.1	1695	5.3	<	0.071		<	0.476		<	0.048		<	0.071		<	0.024		<	0.476	
bo	IA1 Main Entrance	Oct 15 - 17	3.1	1715	5.3	<	0.071	0.07	<	0.470	0.47	<	0.047	0.05	<	0.071	0.07	<	0.024	0.02	<	0.470	0.47
	IA2 Kitchen	Oct 15 - 16	3.1	1683	5.2	<	0.072		<	0.479		<	0.048		<	0.072		<	0.024		<	0.479	
br	IA1 Living Room off entranceway	Oct 20	15	475	7.1	<	0.053	0.05	<	0.351	0.35	<	0.035	0.04	<	0.053	0.05	<	0.018	0.02	<	0.351	0.35
	IA2 Dining Room Area	Oct 20	15	475	7.1	<	0.053		<	0.351		<	0.035		<	0.053		<	0.018		<	0.351	
bs	IA1 Kitchen Front Entranceway	Oct 22 - 23	3.1	1690	5.2	<	0.072	0.07	<	0.477	0.48	<	0.048	0.05	<	0.072	0.07	<	0.024	0.02	<	0.477	0.48
	IA2 Living Room	Oct 22 - 23	3.1	1693	5.2	<	0.071		<	0.476		<	0.048		<	0.071		<	0.024		<	0.476	
bt	IA1 Living Room (Entranceway)	Oct 20 - 22	3.1	1708	5.3	<	0.071	0.07	<	0.472	0.48	<	0.047	0.05	<	0.071	0.07	<	0.024	0.02	<	0.472	0.48
	IA2 Kitchen	Oct 16, 20 - 21	3.1	1636	5.1	<	0.074		<	0.493		<	0.049		<	0.074		<	0.025		<	0.493	
r	IA1 Kitchen	Oct 19 - 20	3.1	1812	5.6	<	0.067	0.07	<	0.445	0.44	<	0.045	0.04	<	0.067	0.07	<	0.022	0.02	<	0.445	0.44
	IA2 Dining Room	Oct 19 - 20	3.1	1813	5.6	<	0.067		<	0.445		<	0.044		<	0.067		<	0.022		<	0.445	
bu	IA1 Front Entranceway	Oct 15, 20 - 21	3.1	1221	3.8	<	0.099	0.09	<	0.660	0.57	<	0.066	0.06	<	0.099	0.09	<	0.033	0.03	<	0.660	0.57
	IA2 Living Room	Oct 15 - 16	3.1	1683	5.2	<	0.072		<	0.479		<	0.048		<	0.072		<	0.024		<	0.479	
bp	IA1 Living Room, Rear Entranceway	Oct 13 - 14	3.1	1693	5.2	<	0.071	0.07	<	0.476	0.48	<	0.048	0.05	<	0.071	0.07	<	0.024	0.02	<	0.476	0.48
	IA2 Rear Bedroom/Storage Area	Oct 13 - 14	3.1	1687	5.2	<	0.072		<	0.478		<	0.048		<	0.072		<	0.024		<	0.478	
s	IA1 Living Room	Oct 8 - 9	3.1	1733	5.4	<	0.070	0.07	<	0.465	0.47	<	0.047	0.05	<	0.070	0.07	<	0.023	0.02	<	0.465	0.47
	IA2 Kitchen	Oct 8 - 9	3.1	1735	5.4	<	0.070		<	0.465		<	0.046		<	0.070		<	0.023		<	0.465	
j	IA1 Front Entranceway	Oct 15 - 16	3.1	1699	5.3	<	0.071	0.07	<	0.475	0.47	<	0.047	0.05	<	0.071	0.07	<	0.024	0.02	<	0.475	0.47
	IA2 Kitchen	Oct 15 - 16	3.1	1697	5.3	<	0.071		<	0.475		<	0.048		<	0.071		<	0.024		<	0.475	
bv	IA1 Kitchen (Entranceway)	Oct 23 - 24	3.1	1696	5.3	<	0.071	0.07	<	0.476	0.48	<	0.048	0.05	<	0.071	0.07	<	0.024	0.02	<	0.476	0.48
	IA2 Living Room	Oct 23 - 24	3.1	1698	5.3	<	0.071		<	0.475		<	0.047		<	0.071		<	0.024		<	0.475	
bw	IA1 Kitchen (Entranceway)	Oct 22 - 23	3.1	1687	5.2	<	0.072	0.07	<	0.478	0.48	<	0.048	0.05	<	0.072	0.07	<	0.024	0.02	<	0.478	0.48
	IA2 Living Room	Oct 22 - 24	3.1	1678	5.2	<	0.072		<	0.481		<	0.048		<	0.072		<	0.024		<	0.481	
k	IA1 Living/Dining Room	Oct 21 - [illegible]	3.1	1687	5.2	<	0.072	0.07	<	0.478	0.48	<	0.048	0.05	<	0.072	0.07	<	0.024	0.02	<	0.478	0.48
	IA2 Kitchen (Rear Entranceway)	Oct 15 - 17	3.1	1682	5.2	<	0.072		<	0.479		<	0.048		<	0.072		<	0.024		<	0.479	
f	IA1 Living Room	Oct 8 - 9	3.1	1766	5.5	<	0.068	0.07	<	0.457	0.46	<	0.046	0.05	<	0.068	0.07	<	0.023	0.02	<	0.457	0.46
	IA2 Rear Kitchen	Oct 8 - 9	3.1	1763	5.5	<	0.069		<	0.457		<	0.046		<	0.069		<	0.023		<	0.457	

Appendix D.8: Indoor Air Samples Analyzed for Metals

	House ID	Description	Sam	Arsenic Filter Conc. ug/filter	Arsenic Air Conc. µg/m3	Arsenic House Average ug/m3	Uranium Filter Conc. ug/filter	Uranium Air Conc. µg/m3	Uranium House Average ug/m3
RL				25			5 0		
	u	IA1- Playroom Main Floor	Oct. 8	<	0 022	0 02	<	0 439	0 44
		IA2	Oct. 8	<	0 022		<	0 439	
	m	IA1-Entranceway	Oct 1	<	0 021	0.02	<	0 416	0 42
		IA2-Catwalk at top of stairs	Oct. 1	<	0.021		<	0 420	
Min				13	0.01	0 02	2 5	0 29	0 31
Max				13	0 03	0 03	2 5	0 67	0 57
Median				13	0 02	0.02	2 5	0 47	0 47
Mean				13	0 02	0 02	2 5	0 47	0 47
Standard Deviation				00	0.0	0.0	0 0	0.05	0.04
Reference									
	a	IA1-Supervisor's Office	Oc	<	0 009	0 01	<	0 184	0 18
		IA2-Councillor's Chambers	Oc	<	0 009		<	0 184	
	b	IA1-Kitchen	Oc	<	0 024	0 02	<	0 481	0 48
		IA2-Living Room	Oc	<	0.024		<	0.481	
QA/QC									
TRIP BLANKS									
Trip Blank A				<			<		
Trip Blank B				<			<		
FIELD BLANKS									
Field Blank A				<			<		
Field Blank B				<			<		
Field Blank C				<			<		
Field Blank D				<			<		
Field Blank E				<			<		
Field Blank F				<			<		
Field Blank G				<			<		
Field Blank H				<			<		
Field Blank I				<			<		
Field Blank J				<			<		
LAB DUPLICATES									
	ai	IA2-Dining Room	Oct 2	<	0 024	0 02	<	0 472	0 47
	br	IA1-Living Room off entranceway	Oct 2	<	0 018	0 02	<	0 351	0 35
	an	IA1-Family Room	Oct 8	<	0 024	0 02	<	0 480	0 48
	an	IA2-Living Room	Oct. 8	<	0 021	0 02	<	0 428	0 43
	g	IA1-Library	Oct 1	<	0 024	0 02	<	0 480	0 48
	ap	IA1-Kitchen (Entranceway)	Oct 2	<	0 018	0 02	<	0 368	0 37
	v	IA1-Kitchen	Oct 2	<	0 024	0 02	<	0 475	0 48
	af	IA2-Entranceway/Play Area	Oct. 1	<	0.021	0.02	<	0 421	0 42

			Arsenic	Uranium
CRITERIA	Reporting Limit			
AAQC		Current	0 3	nc
		Proposed	0 05	nc
POI STANDARD	Less than R	Current	1	nc
		Proposed	0 15	nc
TYPICAL		Lower range	1	
		Upper Range	1.9	

Note:

RL Reporting Limit

0 5* RL used to calculated min, max, etc.

IA1, IA2 Locations of indoor low volume samplers

IA1(2) Two cassettes were used to acquire the sample

Appendix D 8 Indoor Air Samples Analyzed for Metals

	House ID	Description	Sample Date	Flow (lpm)	Sample Time (min)	Volume of Air (m3)	Cobalt Filter Conc ug/filter	Cobalt Air Conc. µg/m3	Cobalt House Average ug/m3	Lead Filter Conc ug/filter	Lead Air Conc µg/m3	Lead House Average ug/m3	Nickel Filter Conc ug/filter	Nickel Air Conc µg/m3	Nickel House Average ug/m3	Silver Filter Conc ug/filter	Silver Air Conc. µg/m3	Silver House Average ug/m3	Arsenic Filter Conc. ug/filter	Arsenic Air Conc µg/m3	Arsenic House Average ug/m3	Uranium Filter Conc ug/filter	Uranium Air Conc. µg/m3	Uranium House Average ug/m3
RL							0.75			5.0			0.50			0.75			0.25			5.0		
	u	IA1- Playroom Main Floor	Oct 8 - 9	3.1	1835	5.7	<	0.066	0.07	<	0.439	0.44	<	0.044	0.04	<	0.066	0.07	<	0.022	0.02	<	0.439	0.44
		IA2	Oct 8 - 9	3.1	1835	5.7	<	0.066		<	0.439		<	0.044		<	0.066		<	0.022		<	0.439	
	m	IA1-Entranceway	Oct 16	15	401	6.0	<	0.062	0.06	<	0.416	0.42	<	0.042	0.04	<	0.062	0.06	<	0.021	0.02	<	0.416	0.42
		IA2-Catwalk at top of stairs	Oct 16	15	397	6.0	<	0.063		<	0.420		<	0.042		<	0.063		<	0.021		<	0.420	
Min				3.1	352	3.73	0.38	0.04	0.05	2.5	0.29	0.31	0.25	0.03	0.03	0.38	0.04	0.05	0.13	0.01	0.02	2.5	0.29	0.31
Max				15	2785	8.63	0.38	0.10	0.09	2.5	0.67	0.57	2.10	0.40	0.22	0.38	0.10	0.09	0.13	0.03	0.03	2.5	0.67	0.57
Median				3.1	1697	5.28	0.38	0.07	0.07	2.50	0.47	0.47	0.25	0.05	0.05	0.38	0.07	0.07	0.13	0.02	0.02	2.5	0.47	0.47
Mean				4.2	1597	5.44	0.38	0.07	0.07	2.5	0.47	0.47	0.27	0.05	0.05	0.38	0.07	0.07	0.13	0.02	0.02	2.5	0.47	0.47
Standard Deviation				3.43	410	0.69	0.0	0.01	0.01	0.0	0.05	0.04	0.17	0.03	0.02	0.00	0.01	0.01	0.00	0.0	0.0	0.0	0.05	0.04
Reference																								
	a	IA1 Supervisor's Office	Oct 21 - 22	15	905	13.6	<	0.028	0.03	<	0.184	0.18	<	0.018	0.02	<	0.028	0.03		0.009	0.01	<	0.184	0.18
		IA2 Councillor's Chambers	Oct 21 - 22	15	905	13.6	<	0.028		<	0.184		<	0.018		<	0.028			0.009		<	0.184	
	b	IA1 Kitchen	Oct 24 - 25	3.1	1678	5.2	<	0.072	0.07	<	0.481	0.48	<	0.048	0.05	<	0.072	0.07	<	0.024	0.02	<	0.481	0.48
		IA2 Living Room	Oct 24 - 25	3.1	1678	5.2	<	0.072		<	0.481		<	0.048		<	0.072		<	0.024		<	0.481	
QA/QC																								
TRIP BLANKS																								
Trip Blank A							<			<			<			<			<			<		
Trip Blank B							<			<			<			<			<			<		
FIELD BLANKS																								
Field Blank A							<			<			<			<			<			<		
Field Blank B							<			<			<			<			<			<		
Field Blank C							<			<			<			<			<			<		
Field Blank D							<			<			<			<			<			<		
Field Blank E							<			<			<			<			<			<		
Field Blank F							<			<			<			<			<			<		
Field Blank G							<			<			<			<			<			<		
Field Blank H							<			<			<			<			<			<		
Field Blank I							<			<			<			<			<			<		
Field Blank J							<			<			<			<			<			<		
LAB DUPLICATES																								
	ai	IA2 Dining Room	Oct 20 - 21	3.1	1710	5.3	<	0.071	0.07	<	0.472	0.47	<	0.047	0.05	<	0.071	0.07	<	0.024	0.02	<	0.472	0.47
	br	IA1 Living Room off entranceway	Oct 20	15	475	7.1	<	0.053	0.05	<	0.351	0.35	<	0.035	0.04	<	0.053	0.05	<	0.018	0.02	<	0.351	0.35
	an	IA1 Family Room	Oct 8 - 9	3.1	1661	5.2	<	0.072	0.07	<	0.480	0.48	2.1	0.403	0.40	<	0.072	0.07	<	0.024	0.02	<	0.480	0.48
	an	IA2 Living Room	Oct 8 - 10	3.1	1885	5.8	<	0.064	0.06	<	0.428	0.43	<	0.043	0.04	<	0.064	0.06	<	0.021	0.02	<	0.428	0.43
	g	IA1 Library	Oct 13 - 14	3.1	1680	5.2	<	0.072	0.07	<	0.480	0.48	<	0.048	0.05	<	0.072	0.07	<	0.024	0.02	<	0.480	0.48
	ap	IA1 Kitchen (Entranceway)	Oct 22 - 23	3.1	2192	6.8	<	0.055	0.06	<	0.368	0.37	<	0.037	0.04	<	0.055	0.06	<	0.018	0.02	<	0.368	0.37
	v	IA1 Kitchen	Oct 21 - 22	3.1	1697	5.3	<	0.071	0.07	<	0.475	0.48	<	0.048	0.05	<	0.071	0.07	<	0.024	0.02	<	0.475	0.48
	af	IA2 Entranceway/Play Area	Oct 13 - 15	3.1	1914	5.9	<	0.063	0.06	<	0.421	0.42	<	0.042	0.04	<	0.063	0.06	-	0.021	0.02	<	0.421	0.42

CRITERIA	Reporting Limit		Cobalt	Lead	Nickel	Silver	Arsenic	Uranium
AAQC		Current	0.1	2.0	2.0	1.0	0.3	nc
		Proposed			0.2		0.05	nc
POI STANDARD	Less than RL	Current	0.3	6	5	3	1	nc
		Proposed			0.6		0.15	nc
TYPICAL		Lower range					1	
		Upper Range					1.9	

Note

RL	Reporting Limit
0.5* RL used to calculated min max etc	
IA1 IA2	Locations of indoor low volume samplers
IA1(2)	Two cassettes were used to acquire the sample

Appendix D.9: Indoor Wipes Analyzed for Metals

RL	Study ID	Sample Date		Cobalt ug/100 cm2 0.75	Cobalt Household averages	Lead ug/100 cm2 5.0	Lead Household averages	Nickel ug/100 cm2 0.50	Nickel	Nickel Household averages	Silver ug/100 cm2 0.75	Silver Household averages	Arsenic ug/100 cm2 0.25	Arsenic Household averages	Uranium ug/100 cm2 5.0	Uranium Household averages
	bz	Oct 17	W1-Entranceway Wall Stud	<	0.38	<	2.5	3.1	3.1	2.65	<	0.38	<	0.13	<	2.5
			W2-Kitchen Shelf	<		<		2.2	2.2		<		<		<	
	v	Oct 8	W1-Living Room	<	0.38	<	5.8	0.80	0.8	0.80	<	0.38	<	0.13	<	2.5
			W2-Kitchen Top of Fridge	<		9.0		0.80	0.8		<		<		<	
	by	Oct 9	W1-Living Room Top of TV	<	0.38	<	2.5	0.70	0.7	1.35	<	0.38	<	0.13	<	2.5
			W2-Kitchen Top of Fridge	<		<		2.0	2		<		<		<	
	x	Oct 9	W1-Kitchen Top of Fridge	<	0.38	<	2.5	1.0	1	0.85	<	0.38	<	0.13	<	2.5
			W2-Dining Room	<		<		0.70	0.7		<		<		<	
	y	Oct 15	W1-Living Room Top of VCR	<	0.38	<	2.5	<	0.25	0.45	<	0.38	<	0.13	<	2.5
			W2-Kitchen Top of Fridge	<		<		0.65	0.65		<		<		<	
	z	Oct 13	W1-Kitchen Top of Fridge	<	0.38	<	2.5	0.67	0.67	0.46	<	0.38	<	0.13	<	2.5
			W2-Living Room TV Stand	<		<		<	0.25		<		<		<	
	aa	Oct 9	W1-Kitchen Top of Fridge	<	0.38	<	66.3	0.68	0.68	0.84	<	0.38	1.6	0.86	<	2.5
			W2-Living Room Lamp Shade	<		130		1.0	1		<		<		<	
	ac	Oct 15	W1 Kitchen Top of Fridge	<	0.38	<	4.6	1.4	1.4	1.15	<	0.38	0.64	0.61	<	2.5
			W2-Living Room Top of Speaker	<		6.6		0.89	0.89		<		0.58		<	
	ae	Oct 10	W1 Kitchen Top of Fridge	<	0.38	<	2.5	1.6	1.6	1.22	<	0.38	0.76	0.93	<	2.5
			W2-Living Room	<		<		0.83	0.83		<		1.1		<	
	af	Oct 13	W1-Kitchen Top of Fridge	<	0.38	<	2.5	0.81	0.81	0.68	<	0.38	<	0.30	<	2.5
			W2-Living Room Top of Stereo stand	<		<		0.54	0.54		<		0.48		<	
	ag	Oct 15	W1-Living Room Top of TV	<	0.38	<	2.5	0.92	0.92	0.85	<	0.38	<	0.13	<	2.5
			W2-Kitchen Top of Fridge	<		<		0.78	0.78		<		<		<	
	h	Oct 16	W1-Entranceway Top of Shelf	<	0.38	5.3	3.9	1.6	1.6	0.93	<	0.38	<	0.54	<	2.5
			W2-Store Window Ledge	<		<		<	0.25		<		0.95		<	
	ah	Oct 9	W1- Kitchen Top of Fridge	<	0.38	<	2.5	<	0.25	0.25	<	0.38	<	0.13	<	2.5
			W2-Living Room	<		<		<	0.25		<		<		<	
	ai	Oct 15	W1-Dining Room Top of Buffet	<	0.38	18	10.3	0.92	0.92	0.59	<	0.38	<	0.13	<	2.5
			W2-Kitchen Top of Fridge	<		<		<	0.25		<		<		<	
	ak	Oct 8	W1 Kitchen Top of Fridge	<	0.38	<	2.5	<	0.25	0.38	<	0.38	<	0.13	<	2.5
			W2 Living Room TV Stand	<		<		0.50	0.5		<		<		<	
	al	Oct 9	W1 Living Room Top of Cabinet	<	0.38	<	2.5	1.2	1.2	1.10	<	0.38	<	0.45	<	2.5
			W2-Kitchen Top of Fridge	<		<		1.0	1		<		0.77		<	
	am	Oct 8	W1-Dining Room Top of Buffet	0.88	0.63	8.6	24.3	1.9	1.9	1.65	<	0.38	0.95	0.72	<	2.5
			W2 Living Room Top of Piano	<		40		1.4	1.4		<		0.48		<	
	an	Oct 9	W1 Kitchen Top of Fridge	<	0.38	<	2.5	1.0	1	0.80	<	0.38	<	0.13	<	2.5
			W2-Living Room TV Stand	<		<		0.60	0.6		<		<		<	
	ao	Oct 13	W1 Kitchen Top of Fridge	<	0.38	<	2.5	1.0	1	0.63	<	0.38	<	0.13	<	2.5
			W2 Living Room TV Stand	<		<		<	0.25		<		<		<	
	ap	Oct 8	W1-Living Room	<	0.38	<	2.5	1.0	1	1.00	<	0.38	<	0.13	<	2.5
			W2 Kitchen Top of Fridge	<		<		1.0	1		<		<		<	
	aq	Oct 16	W1 Window Ledge Main Entrance	<	0.66	<	11.3	0.67	0.67	1.19	<	0.38	<	1.31	<	2.5
			W2-Kitchen Top of Fridge	0.95		20		1.7	1.7		<		2.5		<	
	ar	Oct 19	W1 Kitchen Top of Fridge	<	0.38	<	2.5	1.5	1.5	0.88	<	0.38	<	0.13	<	2.5
			W2 Rear Bedroom Bookcase	<		<		<	0.25		<		<		<	
	at	Oct 9	W1 Living Room	<	0.38	<	2.5	1.0	1	1.80	<	0.38	<	0.13	<	2.5
			W2-Kitchen Top of Fridge	<		<		2.6	2.6		<		<		<	
	au	Oct 15	W1 Window Ledge at Entranceway	1.2	0.79	18	10.3	0.74	0.74	0.66	<	0.38	<	0.13	<	2.5
			W2-Living Room Top of Woodstove	<		<		0.58	0.58		<		<		<	
	c	Oct 9	W1 Kitchen Top of Fridge	<	0.38	<	2.5	0.95	0.95	0.60	<	0.38	<	0.13	<	2.5
			W2-Living Room Top of TV	<		<		<	0.25		<		<		<	
	av	Oct 10	W1 Kitchen Top of Fridge	<	0.38	<	2.5	0.86	0.86	0.56	<	0.38	<	0.13	<	2.5
			W2 Living Room/Play Room Top of De	<		<		<	0.25		<		<		<	
	ax	Oct 8	W1 Kitchen Top of Fridge	<	0.38	25	17.5	2.0	2	2.50	<	0.38	<	0.13	<	2.5
			W2-Front Room Top of Cabinet	<		10		3.0	3		<		<		<	

RL	Study ID	Sample Date		ug/100 cm2 0.75	Household averages	ug/100 cm2 5.0	Household averages	ug/100 cm2 0.50		Household averages	ug/100 cm2 0.75	Household averages	ug/100 cm2 0.25	Household averages	ug/100 cm2 5.0	Household averages
	p	Oct 10	W1-Kitchen Top of Fridge	<	0.38	5.1	3.8	0.87	0.87	0.56	<	0.38	0.76	0.44	<	2.5
			W2-Living Room/Playroom	<		<		<	0.25		<		<		<	
	ay	Oct 13	W1-Kitchen Top of Fridge	1.2	0.79	15	8.8	2.3	2.3	1.49	<	0.38	1.7	0.91	<	2.5
			W2-Living Room TV Area	<		<		0.67	0.67		<		<		<	
	az	Oct 9	W1-Kitchen Top of Fridge	<	0.38	<	2.5	4.3	4.3	2.47	<	0.38	<	0.13	<	2.5
			W2-Living Room Top of TV	<		<		0.63	0.63		<		<		<	
	bb	Oct 8	W1-Living Room	<	0.38	<	2.5	0.50	0.5	1.50	<	0.38	<	0.13	<	2.5
			W2-Kitchen Top of Fridge	<		<		2.5	2.5		<		<		<	
	bf	Oct 16	W1-Kitchen Top of Fridge	<	0.38	<	2.5	0.89	0.89	0.86	<	0.38	<	0.13	<	2.5
			W2-Kitchen Near Entranceway	<		<		0.82	0.82		<		<		<	
	q	Oct 10	W1-Kitchen Top of Fridge	<	0.38	<	2.5	0.61	0.61	0.62	<	0.38	<	0.37	<	2.5
			W2-Living Room/Playroom Top of Fish	<		<		0.63	0.63		<		0.62		<	
	bh	Oct 8	W1-Living Room	<	0.38	<	2.5	<	0.25	0.63	<	0.38	<	0.13	<	2.5
			W2-Kitchen Top of Fridge	<		<		1.0	1		<		<		<	
	bi	Oct 9	W1-Living Room Top of TV	<	0.38	<	2.5	3.0	3	2.05	<	0.38	0.77	1.54	<	2.5
			W2-Kitchen Top of Fridge	<		<		1.1	1.1		<		2.3		<	
	e	Oct 8	W1-Living Room	<	0.38	<	2.5	0.50	0.5	0.50	<	0.38	<	0.13	<	2.5
			W2-Kitchen Top of Fridge	<		<		0.50	0.5		<		<		<	
	bj	Oct 15	W1-Front Room Top of Shelf	<	0.38	<	2.5	0.60	0.6	1.20	3.7	2.04	<	0.13	<	2.5
			W2-Kitchen Top of Fridge	<		<		1.8	1.8		<		<		<	
	bl	Oct 8	W1-Kitchen Top of Fridge	<	0.38	<	2.5	0.67	0.67	0.63	<	0.38	<	0.13	<	2.5
			W2-Rear Room Library	<		<		0.58	0.58		<		<		<	
	bm	Oct 13	W1-Kitchen Top of Fridge	<	0.38	<	2.5	0.60	0.6	0.43	<	0.38	<	0.13	<	2.5
			W2-Living Room Top of Fan Blades	<		<		<	0.25		<		<		<	
	bn	Oct 13	W1-Kitchen Top of Fridge	<	0.38	<	2.5	1.0	1	0.63	<	0.38	<	0.13	<	2.5
			W2-Living Room TV Stand	<		<		<	0.25		<		<		<	
	bo	Oct 13	W1-Kitchen Top of Fridge	<	0.38	<	2.5	<	0.25	0.25	<	0.38	<	0.13	<	2.5
			W2-Living Room Top of Fan Blades	<		<		<	0.25		<		<		<	
	br	Oct 9	W1-Living Room/Play Area	<	0.38	<	2.5	1.2	1.2	1.45	<	0.38	<	0.13	<	2.5
			W2-Kitchen Top of Fridge	<		<		1.7	1.7		<		<		<	
	bs	Oct 16	W1-Kitchen Top of Fridge	<	0.38	<	2.5	3.0	3	1.79	<	0.38	<	0.13	<	2.5
			W2-Living Room Top of TV	<		<		0.58	0.58		<		<		<	
	bt	Oct 9	W1-Kitchen top of Fridge	<	0.38	<	2.5	<	0.25	0.25	<	0.38	<	0.13	<	2.5
			W2-Living Room Top of TV	<		<		<	0.25		<		<		<	
	r	Oct 9	W1-Kitchen Top of Fridge	<	0.38	<	2.5	0.68	0.68	0.47	<	0.38	<	0.13	<	2.5
			W2-Dining Room China Cabinet	<		<		<	0.25		<		<		<	
	bp	Oct 9	W1-Living Room TV Stand	<	0.38	<	2.5	0.69	0.69	0.79	<	0.38	<	0.13	<	2.5
			W2-Kitchen Top of Microwave	<		<		0.89	0.89		<		<		<	
	bu	Oct 9	W1-Kitchen Top of Fridge	<	0.38	<	2.5	0.90	0.9	0.58	<	0.38	<	0.13	<	2.5
			W2-Living Room Bookcase	<		<		<	0.25		<		<		<	
	j	Oct 15	W1-Kitchen Top of Fridge	<	0.38	<	2.5	1.0	1	0.84	<	0.38	<	0.13	<	2.5
			W2-Living Room Top of TV	<		<		0.67	0.67		<		<		<	
	s	Oct 9	W1-Kitchen Top of Fridge	<	0.38	<	4.5	0.71	0.71	0.81	<	0.38	<	0.13	<	2.5
			W2-Dining Room Top of China Cabine	<		6.5		0.90	0.9		<		<		<	
	bv	Oct 9	W1-Living Room Top of TV Stand	<	0.38	<	2.5	<	0.25	0.25	<	0.38	<	0.13	<	2.5
			W2-Kitchen Top of Microwave	<		<		<	0.25		<		<		<	
	bw	Oct 9	W1-Kitchen Top of Fridge	<	0.38	<	2.5	1.0	1	1.35	<	0.38	<	1.01	<	2.5
			W2-Top of Hutch	<		<		1.7	1.7		<		1.9		<	
	k	Oct 10	W1-Kitchen Top of Fridge	<	0.38	<	2.5	0.75	0.75	0.50	<	0.38	<	0.13	<	2.5
			W2- Living Room	<		<		<	0.25		<		<		<	
	f	Oct 9	W1-Den Top of Stereo	<	0.38	<	2.5	0.98	0.98	1.64	<	0.38	<	0.13	<	2.5
			W2-Kitchen Small Shelf	<		<		2.3	2.3		<		<		<	
	u	Oct 9	W1-Living Room Top of TV	<	0.38	<	2.5	1.3	1.3	1.02	<	0.38	<	0.40	<	2.5
			W2-Kitchen Top of Fridge	<		<		0.74	0.74		<		0.67		<	
	g	Oct 13	W1-Library Top of Bookshelf	<	0.38	<	2.5	0.79	0.79	1.15	<	0.38	<	0.13	<	2.5
			W2-Hall Kitchen Top of Friddge	<		<		1.5	1.5		<		<		<	
	m	Oct 16	W1- Shelf Near Entranceway	<	1.09	14	16.0	1.1	1.1	1.80	<	0.38	0.54	0.76	<	2.5

	Study ID	Sample Date		ug/100 cm2	Household averages	ug/100 cm2	Household averages	ug/100 cm2		Household averages	ug/100 cm2	Household averages	ug/100 cm2	Household averages	ug/100 cm2	Household averages
RL				0.75		5.0		0.50			0.75		0.25		5.0	
			W2-Catwalk Railing	1.8		18		2.5	2.5		<		0.97		<	
Min				0.375	0.38	2.5	2.5	0.25		0.25	0.375	0.38	0.125	0.13	2.5	2.5
Max				1.8	1.09	130	66.3	4.3		2.65	3.7	2.04	2.5	1.54	2.5	2.5
Median				0.375	0.38	2.5	2.50	0.8		0.84	0.375	0.38	0.125	0.13	2.5	2.5
Mean				0.41	0.41	5.26	5.3	0.99		0.99	0.40	0.40	0.29	0.29	2.5	2.5
Standard Deviation				0.19	0.13	13.02	9.3	0.76		0.58	0.31	0.22	0.44	0.33	0.0	0.0
Reference																
	a	Oct 21	W1-Entranceway Top of Shelf	<	0.38	<	2.5	0.52	0.52	0.39	<	0.38	<	0.13	<	2.5
			W2-Supervisor's Office Top of Shelf	<		<		<	0.25		<		<		<	
	b	Oct 16	W1 Living Room Top of VCR	<	0.38	<	2.5	0.68	0.68	0.74	<	0.38	<	0.13	<	2.5
			W2-Kitchen Top of Fridge	<		<		0.79	0.79		<		<		<	
QA/QC																
SAMPLE DUPLICATES																
	ao	Nov 12	WA1 -Kitchen Top of Fridge	<		<		<			<		<		<	
			WA2 -Kitchen Top of Fridge	<		<		<			<		<		<	
	ao	Nov 12	WB1 -Living Room Top of VCR	<		<		<			<		<		<	
			WB2 -Living Room Top of VCR	<		<		<			<		<		<	
	v	Nov 12	WA1 -Kitchen Top of Fridge	<		<		<			<		<		<	
			WA2 -Kitchen Top of Fridge	<		9.3		<			<		<		<	
	v	Nov 12	WB1 -Dining Room Top of Buffet	<		<		<			<		<		<	
			WB2 -Dining Room Top of Buffet	<		<		<			<		<		<	
	ah	Nov 12	WA1 -Living Room Top of TV Cabinet	<		<		<			<		<		<	
			WA2 -Living Room Top of TV Cabinet	<		<		<			<		<		<	
	ah	Nov 12	WB1 -Kitchen Top of Fridge	<		<		<			<		<		<	
			WB2 -Kitchen Top of Fridge	<		<		<			<		<		<	
	hb	Nov 12	WA1 -Kitchen Top of Fridge	<		<		<			<		<		<	
			WA2 -Kitchen Top of Fridge	<		<		0.61			<		<		<	
	bb	Nov 12	WB1 -Living Room TV	<		<		<			<		<		<	
			WB2 -Living Room TV	<		<		<			<		<		<	
	bv	Nov 12	WA1 -Kitchen Top of Microwave	<		<		<			<		<		<	
			WA2 -Kitchen Top of Microwave	<		<		<			<		<		<	
	bv	Nov 12	WB1 -Living Room Top of TV Stand	<		<		<			<		<		<	
			WB2 -Living Room Top of TV Stand	<		<		<			<		<		<	
	g	Nov 12	WA1 -Hall Kitchen Top of Fridge	<		<		<			<		<		<	
			WA2 -Hall Kitchen Top of Fridge	<		<		0.61			<		<		<	
	g	Nov 12	WB1 -Library Top of Bookshelf	<		<		<			<		<		<	
			WB2 -Library Top of Bookshelf	<		<		<			<		<		<	
TRIP BLANKS																
Trip Blank A				<		<		<			<		<		<	
Trip Blank B				<		<		<			<		<		<	
FIELD BLANKS																
Field Blank A				<		<		<			<		<		<	
Field Blank B				<		<		<			<		<		<	
Field Blank C				<		<		<			<		<		<	
Field Blank D				<		<		<			<		<		<	
Field Blank E				<		<		<			<		<		<	
Field Blank F				<		<		<			<		<		<	
Field Blank G				<		<		<			<		<		<	
Field Blank H				<		<		<			<		<		<	
Field Blank I				<		<		<			<		<		<	
Field Blank J				<		<		<			<		<		<	
LAB DUPLICATES																
	v	Nov 12	WA2 -Kitchen Top of Fridge	<		10		<			<		<		<	
	r	Nov 12	W2-Dining Room China Cabinet	<		<		0.70			<		<		<	
	ap	Nov 12	W1-Living Room	<		<		<			<		<		<	
	br	Nov 12	W2-Kitchen Top of Fridge	<		<		1.2			<		<		<	

RL	Study ID	Sample Date		ug/100 cm2 0.75	Household averages	ug/100 cm2 5.0	Household averages	ug/100 cm2 0.50	Household averages	ug/100 cm2 0.75	Household averages	ug/100 cm2 0.25	Household averages	ug/100 cm2 5.0	Household averages
	aq	Nov 12	W1-Window Ledge Main Entrance	<		<		0.89		<		<		<	
	ag	Nov 12	W2 Kitchen Top of Fridge	<		<		0.87		<		<		<	
	bo	Nov 12	W1 Kitchen Top of Fridge	<		<		0.51		<		<		<	
	a	Nov 12	W1-Entranceway Top of Shelf	<		<		0.56		<		<		<	

Note:

RL Reporting Limit
0.5*RL used for calculation of min, max etc when value < RL
W1, W2 Wipe location one and two for samples
WA, WB Wipe location one and two for sample duplicates
WA1, WA2 Paired samples duplicate analysis

Appendix D.10: Indoor Wipes Analyzed for Radionuclides

Study ID	Description	Date Sampled	Po-210 Bq/100 cm2	Po-210 Household Average	Pb-210 Bq/100 cm2	Pb-210 Household Average	Th-230 Bq/100 cm2	Th-230 Household Average	Ra-226 Bq/100 cm2	Ra-226 Household Average
RL			0.01		various		0.01		0.01	
bw	W1-Kitchen Top of Fridge	Oct 9	< 0.01	0.008	0.05	0.035	< 0.01	0.005	< 0.01	0.005
	W2-Top of Hutch		0.01		0.02		< 0.01		< 0.01	
v	W1-Living Room	Oct 8	< 0.01	0.005	0.09	0.060	< 0.01	0.005	< 0.01	0.005
	W2-Kitchen Top of Fridge		< 0.01		0.03		< 0.01		< 0.01	
z	W1-Kitchen Top of Fridge	Oct 13	< 0.01	0.005	0.05	0.060	< 0.01	0.005	< 0.01	0.005
	W2-Living Room TV Stand		< 0.01		0.07		< 0.01		< 0.01	
ae	W1-Kitchen Top of Fridge	Oct 10	< 0.01	0.005	0.03	0.055	< 0.01	0.005	< 0.01	0.005
	W2-Living Room		< 0.01		0.08		< 0.01		< 0.01	
ak	W1-Kitchen Top of Fridge	Oct 8	< 0.01	0.005	0.01	0.015	< 0.01	0.005	< 0.01	0.005
	W2-Living Room TV Stand		< 0.01		0.02		< 0.01		< 0.01	
al	W1-Living Room Top of Cabinet	Oct 9	< 0.01	0.005	< 0.01	0.008	< 0.01	0.005	< 0.01	0.005
	W2-Kitchen Top of Fridge		< 0.01		< 0.02		< 0.01		< 0.01	
bb	W1-Living Room	Oct 8	< 0.01	0.005	0.03	0.030	< 0.01	0.005	< 0.01	0.005
	W2-Kitchen Top of Fridge		< 0.01		0.03		< 0.01		< 0.01	
bh	W1-Living Room	Oct 8	< 0.01	0.005	0.03	0.030	< 0.01	0.005	< 0.01	0.005
	W2-Kitchen Top of Fridge		< 0.01		0.03		< 0.01		< 0.01	
e	W1-Living Room	Oct 8	< 0.01	0.005	< 0.01	0.013	< 0.01	0.005	< 0.01	0.005
	W2-Kitchen Top of Fridge		< 0.01		< 0.04		< 0.01		< 0.01	
bn	W1-Kitchen Top of Fridge	Oct 13	< 0.01	0.005	0.04	0.045	< 0.01	0.005	< 0.01	0.005
	W2-Living Room TV Stand		< 0.01		0.05		< 0.01		< 0.01	
bp	W1-Living Room TV Stand	Oct 9	< 0.01	0.005	< 0.02	0.040	< 0.01	0.005	< 0.01	0.005
	W2-Kitchen Top of Microwave		< 0.01		0.07		< 0.01		< 0.01	
j	W1-Kitchen Top of Fridge	Oct 15	< 0.01	0.005	0.08	0.080	< 0.01	0.005	< 0.01	0.005
	W2-Living Room Top of TV		< 0.01		0.08		< 0.01		< 0.01	
g	W1-Library Top of Bookshelf	Oct 13	0.03	0.018	0.03	0.018	< 0.01	0.005	< 0.01	0.005
	W2-Hall Kitchen Top of Friddge		< 0.01		< 0.01		< 0.01		< 0.01	
Reference										
a	W1-Entranceway Top of Shelf	Oct 21	0.03	0.018	0.08	0.085	< 0.01	0.005	0.13	0.068
	W2-Supervisor's Office Top of Shelf		< 0.01		0.09		< 0.01		< 0.01	
b	W1-Living Room Top of VCR	Oct 16	< 0.01	0.005	0.23	0.125	< 0.01	0.005	< 0.01	0.005
	W2-Kitchen Top of Fridge		< 0.01		0.02		< 0.01		< 0.01	
Min			0.005	0.005	0.005	0.008	0.005	0.005	0.005	0.005
Max			0.030	0.018	0.090	0.080	0.005	0.005	0.005	0.005
Median			0.005	0.005	0.030	0.035	0.005	0.005	0.005	0.005
Mean			0.006	0.006	0.038	0.038	0.005	0.005	0.005	0.005
Standard Deviation			0.005	0.0035	0.0265	0.0219	0.0	0.0	0.0	0.0
QA/QC										
Trip blank			< 0.01		< 0.01		< 0.01		< 0.01	
Field blank			< 0.01		0.02		< 0.01		< 0.01	
Field blank			< 0.01		< 0.01		< 0.01		< 0.01	

Note: Alpha spectrometry for Po-210, Ra-226 and Th-230
Beta counting for Pb-210
RL Laboratory reporting limit
< Less than reporting limit
Reporting limit varies for Pb210
For min, max, mean, and std. dev 0.5*RL used for calculation when value <RL
Po210 results indicate activity on date analyzed

Appendix D.11: Indoor Wipes Analyzed for Total Radioactivity (alpha, beta)
Sample Media Dust

RL	Study ID	Sample Location	Sample Date	Gross Alpha Bq/100cm2 0.02	Household Average Bq/100cm2	Gross Beta Bq/100cm2 0.02	Household Average Bq/100cm2
	bz	W1-Entranceway Wall Stud	Oct 17	0.03	0.02	0.03	0.03
		W2-Kitchen Shelf		<		0.03	
	v	W1-Living Room	Oct. 8	<	0.01	<	0.01
		W2-Kitchen Top of Fridge		<		<	
	by	W1-Living Room Top of TV	Oct. 9	<	0.01	<	0.01
		W2-Kitchen Top of Fridge		<		<	
	x	W1-Kitchen Top of Fridge	Oct. 9	<	0.02	0.04	0.04
		W2-Dining Room		0.02		0.03	
	y	W1-Living Room Top of VCR	Oct 15	<	0.01	<	0.03
		W2-Kitchen Top of Fridge		<		0.04	
	z	W1-Kitchen Top of Fridge	Oct 13	<	0.01	<	0.01
		W2-Living Room TV Stand		<		<	
	aa	W1-Kitchen Top of Fridge	Oct 9	<	0.01	<	0.01
		W2-Living Room Lamp Shade		<		<	
	ac	W1-Kitchen Top of Fridge	Oct 15	<	0.01	0.08	0.06
		W2-Living Room Top of Speaker		<		0.04	
	ae	W1-Kitchen Top of Fridge	Oct 10	<	0.03	<	0.04
		W2-Living Room		0.05		0.07	
	af	W1-Kitchen Top of Fridge	Oct 13	<	0.01	<	0.01
		W2-Living Room Top of Stereo stand		<		<	
	ag	W1-Living Room Top of TV	Oct 15	<	0.01	0.03	0.03
		W2-Kitchen Top of Fridge		<		0.03	
	h	W1-Entranceway Top of Shelf	Oct 16	0.04	0.03	0.06	0.04
		W2-Store Window Ledge		<		<	
	ah	W1- Kitchen Top of Fridge	Oct. 9	<	0.01	<	0.01
		W2-Living Room		<		<	
	ai	W1-Dining Room Top of Buffet	Oct 15	0.02	0.02	0.05	0.05
		W2-Kitchen Top of Fridge		<		0.04	
	ak	W1-Kitchen Top of Fridge	Oct. 8	<	0.01	<	0.01
		W2-Living Room TV Stand		<		<	
	al	W1-Living Room Top of Cabinet	Oct. 9	<	0.01	0.02	0.02
		W2-Kitchen Top of Fridge		<		<	
	am	W1-Dining Room Top of Buffet	Oct. 15	<	0.01	<	0.03
		W2-Living Room Top of Piano		<		0.04	
	an	W1-Kitchen Top of Fridge	Oct. 9	<	0.01	0.02	0.02
		W2-Living Room TV Stand		<		<	
	ao	W1-Kitchen Top of Fridge	Oct. 13	<	0.01	<	0.01
		W2-Living Room TV Stand		<		<	
	ap	W1-Living Room	Oct. 8	0.02	0.02	0.02	0.02
		W2-Kitchen Top of Fridge		<		0.02	
	aq	W1-Window Ledge Main Entrance	Oct 16	<	0.01	<	0.01
		W2-Kitchen Top of Fridge		<		<	
	ar	W1-Kitchen Top of Fridge	Oct 19	<	0.01	<	0.01
		W2-Rear Bedroom Bookcase		<		<	
	at	W1-Living Room	Oct. 9	<	0.01	0.03	0.03
		W2-Kitchen Top of Fridge		<		0.03	
	au	W1-Window Ledge at Entranceway	Oct 15	<	0.01	0.05	0.05
		W2-Living Room Top of Woodstove		<		0.05	
	c	W1-Kitchen Top of Fridge	Oct. 9	0.03	0.02	0.05	0.03
		W2-Living Room Top of TV		<		<	
	av	W1-Kitchen Top of Fridge	Oct. 10	<	0.01	0.04	0.04
		W2-Living Room/Play Room Top of Desk		<		0.03	
	ax	W1-Kitchen Top of Fridge	Oct. 8	<	0.01	0.03	0.03
		W2-Front Room Top of Cabinet		<		0.02	
	p	W1-Kitchen Top of Fridge	Oct. 10	0.02	0.02	0.03	0.03
		W2-Living Room/Playroom		<		0.02	
	ay	W1-Kitchen Top of Fridge	Oct. 13	<	0.02	<	0.03

RL	Study ID	Sample Location	Sample Date	Gross Alpha Bq/100cm2	Household Average Bq/100cm2	Gross Beta Bq/100cm2	Household Average Bq/100cm2
				0.02		0.02	
		W2-Living Room TV Area		0.02		0.04	
	az	W1-Kitchen Top of Fridge	Oct. 9	<	0.01	0.03	0.03
		W2-Living Room Top of TV		<		0.03	
	bb	W1-Living Room	Oct. 8	<	0.02	0.02	0.03
		W2-Kitchen Top of Fridge		0.02		0.04	
	bf	W1-Kitchen Top of Fridge	Oct. 16	<	0.01	<	0.01
		W2-Kitchen Near Entranceway		<		<	
	q	W1-Kitchen Top of Fridge	Oct. 10	0.02	0.02	0.05	0.04
		W2-Living Room/Playroom Top of Fish Tank		<		0.02	
	bh	W1-Living Room	Oct. 8	<	0.01	0.02	0.02
		W2-Kitchen Top of Fridge		<		<	
	bi	W1-Living Room Top of TV	Oct. 9	<	0.01	0.05	0.04
		W2-Kitchen Top of Fridge		<		0.03	
	e	W1-Living Room	Oct. 8	<	0.01	0.02	0.03
		W2-Kitchen Top of Fridge		<		0.03	
	bj	W1-Front Room Top of Shelf	Oct. 15	<	0.01	<	0.01
		W2-Kitchen Top of Fridge		<		<	
	bl	W1-Kitchen Top of Fridge	Oct. 8	<	0.01	<	0.01
		W2-Rear Room Library		<		<	
	bm	W1-Kitchen Top of Fridge	Oct. 13	<	0.01	<	0.01
		W2-Living Room Top of Fan Blades		<		<	
	bn	W1-Kitchen Top of Fridge	Oct. 13	<	0.01	0.03	0.02
		W2-Living Room TV Stand		<		<	
	bo	W1-Kitchen Top of Fridge	Oct. 13	<	0.01	<	0.01
		W2-Living Room Top of Fan Blades		<		<	
	br	W1-Living Room/Play Area	Oct. 9	0.06	0.05	0.08	0.05
		W2-Kitchen Top of Fridge		0.03		0.02	
	bs	W1-Kitchen Top of Fridge	Oct. 16	<	0.01	0.03	0.02
		W2-Living Room Top of TV		<		<	
	bt	W1-Kitchen top of Fridge	Oct. 9	<	0.01	<	0.02
		W2-Living Room Top of TV		<		0.02	
	r	W1-Kitchen Top of Fridge	Oct. 9	<	0.04	0.02	0.06
		W2-Dining Room China Cabinet		0.06		0.10	
	bp	W1-Living Room TV Stand	Oct. 9	<	0.03	0.03	0.06
		W2-Kitchen Top of Microwave		0.05		0.08	
	bu	W1-Kitchen Top of Fridge	Oct. 9	0.06	0.04	0.17	0.09
		W2-Living Room Bookcase		<		<	
	j	W1-Kitchen Top of Fridge	Oct. 15	<	0.01	0.02	0.02
		W2-Living Room Top of TV		<		<	
	s	W1-Kitchen Top of Fridge	Oct. 9	<	0.01	<	0.01
		W2-Dining Room Top of China Cabinet		<		<	
	k	W1-Kitchen Top of Fridge	Oct. 10	<	0.01	<	0.01
		W2- Living Room		<		<	
	bv	W1-Living Room Top of TV Stand	Oct. 9	<	0.01	<	0.01
		W2-Kitchen Top of Microwave		<		<	
	bw	W1-Kitchen Top of Fridge	Oct. 9	<	0.03	<	0.07
		W2-Top of Hutch		0.05		0.13	
	f	W1-Den Top of Stereo	Oct. 9	<	0.01	0.02	0.03
		W2-Kitchen Small Shelf		<		0.03	
	u	W1-Living Room Top of TV	Oct. 9	<	0.01	<	0.01
		W2-Kitchen Top of Fridge		<		<	
	g	W1-Library Top of Bookshelf	Oct. 13	0.02	0.02	0.03	0.02
		W2-Hall Kitchen Top of Fnddge		<		<	
	m	W1- Shelf Near Entranceway	Oct. 16	<	0.01	<	0.02
		W2-Catwalk Railing		<		0.03	
Min				0.010	0.010	0.010	0.010
Max				0.060	0.045	0.170	0.090
Median				0.010	0.010	0.020	0.020
Mean				0.014	0.014	0.025	0.025
Standard deviation				0.011	0.008	0.025	0.018

	Study ID	Sample Location	Sample Date	Gross Alpha Bq/100cm2	Household Average Bq/100cm2	Gross Beta Bq/100cm2	Household Average Bq/100cm2
RL				0 02		0 02	
Reference							
	a	W1-Entranceway Top of Shelf	Oct 21	<	0 01	0 02	0 03
		W2-Supervisor's Office Top of Shelf		<		0 03	
	b	W1-Living Room Top of VCR	Oct 16	<	0 01	<	0.02
		W2-Kitchen Top of Fridge		<		0 02	
QA/QC							
TRIP BLANKS							
Trip blank (W-TB)			Nov 17	< 0 01		< 0.01	
FIELD BLANKS							
Field Blank (W-FB-F)			Nov 17	< 0 01		0 02	
Field Blank (W-FB-G)			Nov 17	< 0 01		< 0 01	

Note: Alpha and Beta measured by Gas Flow Proportional Counter
RL Laboratory reporting limit
< Less than reporting limit
For min, max, mean, and std. dev 0.5*RL used for calculation when value <RL

Appendix D 12: Indoor Dustfall Samples analyzed for Metals - Corrected for 30 days and 100 cm2

	Study ID	Location	Sample Date	Number of Days	Cobalt		Lead		Nickel		Silver		Arsenic		Uranium	
					ug/dish	ug/100cm2 /30 days	ug/dish	ug/100cm2 /30 days	ug/dish	ug/100cm2 /30 days	ug/dish	ug/100cm2 /30 days	ug/dish	ug/100cm2 /30 days	ug/dish	ug/100cm2 /30 days
RL					0 75		5 0		0 50		0 75		0 25		5 0	
	q	Dining Room Top of Fish Tank/Computer	Oct 10-Nov 10	31	<	0 236	<	1 6	4 2	2 64	<	0 236	<	0 079	<	1 6
	s	Living Room Bookcase	Oct 9-Nov 10	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	u	Living Room Top of Buffet	Oct 9-Nov 10	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	z	Kitchen Top of Fridge	Oct 13-Nov 10	28	<	0 261	<	1 7	1 0	0 70	<	0 261	<	0 087	<	1 7
	ae	Kitchen Top of Fridge	Oct 10-Nov 10	31	<	0 236	<	1 6	41	25 76	<	0 236	<	0 079	<	1 6
	ak	Dining Room Top of Hutch	Oct 8-Nov 10	33	<	0 221	<	1 5	<	0 15	<	0 221	<	0 074	<	1 5
	ao	Kitchen Top of Fridge	Oct 13-Nov 10	28	<	0 261	<	1 7	<	0 17	<	0 261	<	0 087	<	1 7
	ay	Kitchen Top of Fridge	Oct 13 Nov 10	28	<	0 261	6 7	4 7	1 3	0 90	<	0 261	<	0 087	<	1 7
	bh	Kitchen Top of Fridge	Oct 8-Nov 10	33	<	0 221	<	1 5	<	0 15	<	0 221	<	0 074	<	1 5
	bi	Living Room Top of TV Stand	Oct 9-Nov 10	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	bl	Kitchen Top of Fridge	Oct 8-Nov 10	33	<	0 221	<	1 5	2 9	1 71	<	0 221	<	0 074	<	1 5
	bn	Kitchen Top of Fridge	Oct 13-ov 10	28	<	0 261	<	1 7	<	0 17	<	0 261	<	0 087	<	1 7
	br	Living Room/Play Area Top of Cabinet	Oct 9-Nov 10	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	bt	Kitchen top of Fridge	Oct 9-Nov 10	32	<	0 228	<	1 5	1 5	0 91	<	0 228	<	0 076	<	1 5
	bu	Kitchen Top of Fridge	Oct 9-Nov 10	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	bw	Main Floor Computer Room	Oct 9-Nov 10	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	p	Kitchen Top of Fridge	Oct 10-Nov 10	31	<	0 236	8 8	5 5	<	0 16	<	0 236	<	0 079	<	1 6
	r	Living Room VCR Stand	Oct 9-Nov 10	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	v	Kitchen Top of Fridge	Oct 8-Nov 10	33	<	0 221	<	1 5	<	0 15	<	0 221	<	0 074	<	1 5
	x	Living Room Top of Buffet	Oct 9-Nov 10	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	aa	Living Room	Oct 9-Nov 10	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	af	Kitchen Top of Fridge	Oct 13-Nov 10	28	<	0 261	<	1 7	<	0 17	<	0 261	<	0 087	<	1 7
	ah	Living Room	Oct 9-Nov 10	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	al	Living Room Top of Cabinet	Oct 9-Nov 10	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	an	Family Room TV Stand	Oct 9-Nov 10	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	ap	Kitchen Top of Fridge	Oct 8-Nov 10	33	<	0 221	<	1 5	<	0 15	<	0 221	<	0 074	<	1 5
	at	Living Room	Oct 9-Nov 10	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	ax	Kitchen Top of Fridge	Oct 8-Nov 10	33	<	0 221	<	1 5	<	0 15	<	0 221	<	0 074	<	1 5
	az	Living Room Top of Corner Unit	Oct 9-Nov 10	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	bb	Shelf	Oct 8-Nov 10	33	<	0 221	<	1 5	<	0 15	<	0 221	<	0 074	<	1 5
	bm	Kitchen Top of Fridge	Oct 13-Nov 10	28	<	0 261	<	1 7	<	0 17	<	0 261	<	0 087	<	1 7
	bo	Kitchen Top of Fridge	Oct 13-Nov 10	28	<	0 261	<	1 7	<	0 17	<	0 261	<	0 087	<	1 7
	bp	Kitchen Top of Microwave	Oct 9-Nov 10	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	bv	Kitchen Top of Microwave	Oct 9-Nov 10	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	by	Living Room Top of TV	Oct 9-Nov 10	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	bz	Living Room Top Shelf	Oct 17-Nov 10	24	<	0 304	<	2 0	<	0 20	<	0 304	<	0 101	<	2 0
	e	Kitchen Top of Fridge	Oct 8-Nov 10	33	<	0 221	<	1 5	<	0 15	<	0 221	<	0 074	<	1 5
	f	Den Near TV	Oct 9-Nov 10	33	<	0 221	<	1 5	<	0 15	<	0 221	<	0 074	<	1 5
	g	Hall Kitchen Top of Fridge	Oct 13 Nov 10	28	<	0 261	<	1 7	<	0 17	<	0 261	<	0 087	<	1 7
	c	Kitchen Top of Fridge	Oct 9-Nov 10	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	k	Kitchen Top of Fridge	Oct 10-Nov 10	31	<	0 236	<	1 6	<	0 16	<	0 236	<	0 079	<	1 6
	ar	Kitchen Top of Fridge	Oct 19-Nov 17	29	<	0 252	<	1 7	72	48 37	<	0 252	<	0 084	<	1 7
	bs	Kitchen Top of Fridge	Oct 16-Nov 16	31	<	0 236	<	1 6	2 2	1 38	<	0 236	<	0 079	<	1 6
	bf	Kitchen Top of Fridge	Oct 16-Nov 16	31	<	0 236	<	1 6	2 5	1 57	<	0 236	<	0 079	<	1 6
	au	Window Ledge at Rear Entranceway	Oct 15-Nov 16	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	h	Store Area Top of Window Ledge	Oct 16-Nov 16	31	<	0 236	<	1 6	<	0 16	<	0 236	<	0 079	<	1 6
	am	Living Room Top of Piano	Oct 15-Nov 16	32	<	0 228	<	1 5	2 8	1 70	<	0 228	<	0 076	<	1 5
	ag	Kitchen Top of Fridge	Oct 15-Nov 16	32	<	0 228	10	6 1	2 2	1 34	<	0 228	<	0 076	<	1 5
	ai	Kitchen Top of Fridge	Oct 15-Nov 16	32	<	0 228	21	12 8	3 3	2 01	<	0 228	<	0 076	<	1 5
	aq	Kitchen Top of Fridge	Oct 16-Nov 16	31	<	0 236	<	1 6	<	0 16	<	0 236	<	0 079	<	1 6
	av	Kitchen Top of Fridge	Oct 10-Nov 16	37	<	0 197	<	1 3	<	0 13	<	0 197	<	0 066	<	1 3

Appendix D.12: Indoor Dustfall Samples analyzed for Metals - Corrected for 30 days and 100 cm2

	Study ID	Location	Sample Date	Number of Days	Cobalt		Lead		Nickel		Silver		Arsenic		Uranium	
					ug/dish	ug/100cm2 /30 days	ug/dish	ug/100cm2 /30 days	ug/dish	ug/100cm2 /30 days	ug/dish	ug/100cm2 /30 days	ug/dish	ug/100cm2 /30 days	ug/dish	ug/100cm2 /30 days
RL					0 75		5 0		0 50		0 75		0 25		5 0	
	j	Kitchen Top of Fridge	Oct 15-Nov 16	32	<	0 228	<	1 5	2 0	1 22	<	0 228	<	0 076	<	1 5
	y	Kitchen Top of Fridge	Oct 15-Nov 16	32	<	0 228	<	1 5	1 3	0 79	<	0 228	<	0 076	<	1 5
	bj	Family Room TV Stand	Oct 9 Nov 10	32	<	0 228	<	1 5	<	0 15	<	0 228	<	0 076	<	1 5
	ac	Kitchen Top of Fridge	Oct 15-Nov 16	32	<	0 228	<	1 5	0 79	0 48	<	0 228	<	0 076	<	1 5
	m	Shelf Naar Entranceway	Oct 16-Nov 16	31	<	0 236	<	1 6	<	0 16	<	0 236	<	0 079	<	1 6
Min				24 0	0 38	0 20	2 5	1 32	0 3	0 13	0 38	0 20	0 13	0 07	2 5	1 32
Max				37 0	0 38	0 30	21 0	12 78	72 0	48 37	0 38	0 30	0 13	0 10	2 5	2 03
Median				32 0	0 38	0 23	2 5	1 52	0 3	0 15	0 38	0 23	0 13	0 08	2 5	1 52
Mean				31 3	0 38	0 23	3 2	1 97	2 7	1 75	0 38	0 23	0 13	0 08	2 5	1 56
Standard Deviation				2 0	0 00	0 02	2 8	1 72	10 9	7 21	0 00	0 02	0 00	0 01	0	0 11
Reference																
	a	Supervisor's Office Top Shelf	Oct 21 Nov 16	26	<	0 281	<	1 9	<	0 19	<	0 281	<	0 094	<	1 9
	b	Kitchen Top of Fridge	Oct 16-Nov 16	31	<	0 236	<	1 6	4 0	2 51	<	0 236	<	0 079	<	1 6
QA/QC																
TRIP BLANKS																
Trip Blank A					<		<		<		<		<		<	
Trip Blank B					<		<		<		<		<		<	
Trip Blank C					<		<		<		<		<		<	
LAB DUPLICATES																
Trip Blank - B		Trip Blank Duplicate			<		<		<		<		<		<	
	aa	Living Room	Oct 9 Nov 10	32	<		<		<		<		<		<	
	an	Family Room TV Stand	Oct 9 Nov 10	32	<		<		<		<		<		<	
	ar	Kitchen Top of Fridge	Oct 19-Nov 17	29	<		<		70		<		<		<	
Criteria								1000								

Notes

RL Reporting Limit

0 5*RL used to calculate min, max, etc

All results scaled to 30-day, 100cm2 dustfall results

Lead Dustfall Criteria from Ontario Regulation 337 Ambient Air Quality Criteria

Appendix D.13: Indoor Dustfall Samples Analyzed for Radionuclides (corrected for 30 days, 100 cm2)

	Study ID	Location	Sample Date	Number of Days	Po-210 Bq/dish	Po-210 Bq/100cm2 /30 days	Pb-210 Bq/dish	Pb-210 Bq/100cm2 /30 days	Th-230 Bq/dish	Th-230 Bq/100cm2 /30 days	Ra-226 Bq/dish	Ra-226 Bq/100cm2 /30 days
RL					varied		0.01		varied		varied	
	v	Kitchen Top of Fridge	Oct. 8-Nov. 10	33	< 0.006	0.0018	< 0.01	0.0030	< 0.003	0.0009	< 0.004	0.0012
	z	Kitchen Top of Fridge	Oct. 13-Nov. 10	28	< 0.001	0.0003	0.08	0.0557	< 0.001	0.0003	< 0.002	0.0007
	ae	Kitchen Top of Fridge	Oct. 10-Nov. 10	31	< 0.001	0.0003	< 0.01	0.0031	< 0.006	0.0019	< 0.004	0.0013
	ak	Dining Room Top of Hutch	Oct. 8-Nov. 10	33	< 0.003	0.0009	< 0.01	0.0030	< 0.002	0.0006	< 0.002	0.0006
	al	Living Room Top of Cabinet	Oct. 9-Nov. 10	32	< 0.003	0.0009	< 0.01	0.0030	< 0.002	0.0006	< 0.002	0.0006
	bb	Shelf	Oct. 8-Nov. 10	33	< 0.003	0.0009	< 0.01	0.0030	< 0.001	0.0003	< 0.001	0.0003
	bh	Kitchen Top of Fridge	Oct. 8-Nov. 10	33	< 0.005	0.0015	0.06	0.0354	< 0.002	0.0006	< 0.001	0.0003
	bn	Kitchen Top of Fridge	Oct. 13-Nov. 10	28	< 0.002	0.0007	0.03	0.0209	< 0.001	0.0003	< 0.001	0.0003
	bp	Kitchen Top of Microwave	Oct. 9-Nov. 10	32	< 0.003	0.0009	0.03	0.0183	< 0.002	0.0006	< 0.001	0.0003
	bw	Main Floor Computer Room	Oct. 9-Nov. 10	32	< 0.003	0.0009	< 0.01	0.0030	< 0.001	0.0003	< 0.002	0.0006
	e	Kitchen Top of Fridge	Oct. 8-Nov. 10	33	< 0.002	0.0006	0.12	0.0708	< 0.001	0.0003	< 0.001	0.0003
	g	Hall Kitchen Top of Fridge	Oct. 13-Nov. 10	28	< 0.001	0.0003	< 0.01	0.0035	< 0.002	0.0007	< 0.004	0.0014
	j	Kitchen Top of Fridge	Oct. 15-Nov. 16	32	< 0.004	0.0012	0.06	0.0365	< 0.002	0.0006	< 0.002	0.0006
Min						0.0003		0.0030		0.0003		0.0003
Max						0.0018		0.0708		0.0019		0.0014
Median						0.0009		0.0035		0.0006		0.0006
Mean						0.0009		0.0199		0.0006		0.0007
Standard deviation						0.0004		0.0230		0.0004		0.0004
Reference												
	a	Supervisor's Office Top Shelf	Oct. 21-Nov. 16	26	< 0.006	0.0022	< 0.01	0.0037	< 0.002	0.0007	< 0.002	0.0007
	b	Kitchen Top of Fridge	Oct. 16-Nov. 16	31	< 0.003	0.0009	0.05	0.0314	< 0.003	0.0009	< 0.001	0.0003
QA/QC												
TRIP BLANKS												
Trip blank (TB-D)					< 0.006		0.09		< 0.002		< 0.001	
Trip blank (TB-E)					< 0.001		0.04		< 0.001		< 0.002	

Note: RL Reporting Limit
0.5*RL used to calculate min, max, etc. when value <RL
All results scaled to 30-day, 100cm2 dustfall results
< Less than RL
Po210 results indicate activity on date analyzed

Appenix D.14: Indoor Dustfall Samples Analyzed for Gross Alpha and Beta (corrected for 30 days, 100 cm2)

RL	Location	Sample Date	Number of Days	Study ID:	Gross Alpha Bq/dish	Gross Alpha Bq/100cm2 /30 days	Gross Beta Bq/dish	Gross Beta Bq/100cm2 /30 days
					0.01		0.01	
	Living Room	Oct 9-Nov 10	32	aa	< 0.01	0.003	< 0.01	0.003
	Kitchen Top of Fridge	Oct 15-Nov 16	32	ac	0.02	0.012	0.01	0.006
	Kitchen Top of Fridge	Oct 10-Nov 10	31	ae	< 0.01	0.003	< 0.01	0.003
	Kitchen Top of Fridge	Oct 13-Nov 10	28	af	< 0.02	0.007	< 0.01	0.003
	Kitchen Top of Fridge	Oct 15-Nov 16	32	ag	< 0.01	0.003	< 0.01	0.003
	Living Room	Oct 9-Nov 10	32	ah	< 0.01	0.003	< 0.01	0.003
	Kitchen Top of Fridge	Oct 15-Nov 16	32	ai	0.02	0.012	0.01	0.006
	Dining Room Top of Hutch	Oct 8-Nov 10	33	ak	< 0.01	0.003	< 0.01	0.003
	Living Room Top of Cabinet	Oct 9-Nov 10	32	al	< 0.01	0.003	< 0.01	0.003
	Living Room Top of Piano	Oct 15-Nov 16	32	am	< 0.01	0.003	0.02	0.012
	Family Room TV Stand	Oct 9-Nov 10	32	an	< 0.01	0.003	< 0.01	0.003
	Kitchen Top of Fridge	Oct 13-Nov 10	28	ao	0.02	0.014	< 0.02	0.007
	Kitchen Top of Fridge	Oct 8-Nov 10	33	ap	< 0.01	0.003	< 0.01	0.003
	Kitchen Top of Fridge	Oct 16-Nov 16	31	aq	< 0.01	0.003	< 0.01	0.003
	Kitchen Top of Fridge	Oct 19-Nov 17	29	ar	< 0.01	0.003	< 0.01	0.003
	Living Room	Oct 9-Nov 10	32	at	0.01	0.006	< 0.01	0.003
	Window Ledge at Rear Entranceway	Oct 15-Nov 16	32	au	< 0.01	0.003	< 0.01	0.003
	Kitchen Top of Fridge	Oct 10-Nov 16	37	av	0.02	0.011	0.01	0.005
	Kitchen Top of Fridge	Oct 8-Nov 10	33	ax	< 0.01	0.003	< 0.01	0.003
	Kitchen Top of Fridge	Oct 13-Nov 10	28	ay	0.02	0.014	0.01	0.007
	Living Room Top of Corner Unit	Oct 9-Nov 10	32	az	0.02	0.012	< 0.02	0.006
	Shelf	Oct 8-Nov 10	33	bb	< 0.01	0.003	0.02	0.012
	Kitchen Top of Fridge	Oct 16-Nov 16	31	bf	< 0.02	0.006	< 0.01	0.003
	Kitchen Top of Fridge	Oct 8-Nov 10	33	bh	< 0.01	0.003	< 0.01	0.003
	Living Room Top of TV Stand	Oct 9-Nov 10	32	bi	< 0.01	0.003	< 0.01	0.003
	Family Room TV Stand	Oct 9-Nov 10	32	bj	0.01	0.006	0.02	0.012
	Kitchen Top of Fridge	Oct 8-Nov 10	33	bl	0.02	0.012	0.01	0.006
	Kitchen Top of Fridge	Oct 13-Nov 10	28	bm	< 0.01	0.003	< 0.01	0.003
	Kitchen Top of Fridge	Oct 13-ov 10	28	bn	< 0.01	0.003	< 0.01	0.003
	Kitchen Top of Fridge	Oct 13-Nov 10	28	bo	0.01	0.007	< 0.02	0.007
	Kitchen Top of Microwave	Oct 9-Nov 10	32	bp	< 0.01	0.003	< 0.01	0.003
	Living Room/Play Area Top of Cabinet	Oct 9-Nov 10	32	br	< 0.01	0.003	0.01	0.006
	Kitchen Top of Fridge	Oct 16-Nov 16	31	bs	< 0.01	0.003	0.01	0.006
	Kitchen top of Fridge	Oct 9-Nov 10	32	bt	< 0.01	0.003	< 0.02	0.006
	Kitchen Top of Fridge	Oct 9-Nov 10	32	bu	0.01	0.006	0.01	0.006
	Kitchen Top of Microwave	Oct 9-Nov 10	32	bv	< 0.01	0.003	< 0.01	0.003
	Main Floor Computer Room	Oct 9-Nov 10	32	bw	< 0.01	0.003	< 0.01	0.003
	Living Room Top of TV	Oct 9-Nov 10	32	by	0.01	0.006	< 0.01	0.003
	Living Room Top Shelf	Oct 17-Nov 10	24	bz	0.01	0.008	0.02	0.016
	Kitchen Top of Fridge	Oct 9-Nov 10	32	c	0.01	0.006	< 0.01	0.003
	Kitchen Top of Fridge	Oct 8-Nov 10	33	e	< 0.01	0.003	< 0.01	0.003

Appenix D.14: Indoor Dustfall Samples Analyzed for Gross Alpha and Beta (corrected for 30 days, 100 cm2)

	Location	Sample Date	Number of Days	Study ID:	Gross Alpha Bq/dish	Gross Alpha Bq/100cm2 /30 days	Gross Beta Bq/dish	Gross Beta Bq/100cm2 /30 days
RL					0.01		0.01	
	Den Near TV	Oct 9-Nov 10	33	f	< 0.01	0.003	0.01	0.006
	Hall Kitchen Top of Fridge	Oct 13-Nov 10	28	g	< 0.01	0.003	< 0.01	0.003
	Store Area Top of Window Ledge	Oct 16-Nov 16	31	h	0.02	0.013	< 0.01	0.003
	Kitchen Top of Fridge	Oct 15-Nov 16	32	j	< 0.01	0.003	< 0.01	0.003
	Kitchen Top of Fridge	Oct 10-Nov 10	31	k	0.01	0.006	< 0.01	0.003
	Shelf Near Entranceway	Oct 16-Nov 16	31	m	0.03	0.019	< 0.01	0.003
	Kitchen Top of Fridge	Oct 10-Nov 10	31	p	< 0.01	0.003	< 0.01	0.003
	Dining Room Top of Fish Tank/Computer	Oct 10-Nov 10	31	q	< 0.01	0.003	< 0.01	0.003
	Living Room VCR Stand	Oct 9-Nov 10	32	r	0.01	0.006	0.01	0.006
	Living Room Bookcase	Oct 9-Nov 10	32	s	< 0.01	0.003	0.01	0.006
	Living Room Top of Buffet	Oct 9-Nov 10	32	u	0.01	0.006	< 0.01	0.003
	Kitchen Top of Fridge	Oct 8-Nov 10	33	v	0.01	0.006	0.01	0.006
	Living Room Top of Buffet	Oct 9-Nov 10	32	x	< 0.01	0.003	< 0.01	0.003
	Kitchen Top of Fridge	Oct 15-Nov 16	32	y	0.01	0.006	< 0.02	0.006
	Kitchen Top of Fridge	Oct 13-Nov 10	28	z	< 0.01	0.003	< 0.01	0.003
Min					0.005		0.005	
Max					0.030		0.020	
Median					0.005		0.005	
Mean					0.009		0.008	
Standard Deviation					0.0060		0.0042	
Reference								
	Supervisor's Office Top Shelf	Oct 21-Nov 16	26	a	< 0.01	0.004	< 0.01	0.004
	Kitchen Top of Fridge	Oct 16-Nov 16	31	b	< 0.01	0.003	< 0.01	0.003
QA/QC								
Blanks								
Trip blank (TB-D-DF)					< 0.02		< 0.01	
Trip blank (TB-E-DF)					< 0.01		< 0.01	

Note: Alpha and Beta measured by Gas Flow Proportional Counter
RL-Laboratory reporting limit
< - less than RL
0.5*RL used for calculations when value less than RL

Appendix D.15: Deloro Drinking Water Wells (first draw) Metals Analysis

Sample Media: Groundwater
Sampled: October 14, 1998

	Study ID	Cobalt	Lead	Nickel	Silver	Arsenic	Uranium
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
RL		0.05	0.0006	0.01	0.00005	0.005	0.10
	bb	<	<	<	<	<	<
	bf	<	<	<	<	<	<
	bh	<	<	<	<	<	<
	bi	<	<	<	<	<	<
	bl	<	<	<	0.00014	<	<
	bm	<	0.0044	<	<	<	<
	bn	<	0.0083	<	<	<	<
	br	<	<	<	<	<	<
	bs	<	<	<	<	<	<
	bt	<	<	<	<	<	<
	bu	<	0.0031	<	<	<	<
	bv	<	0.018	<	0.00024	<	<
	bw	<	0.25	0.01	<	<	<
	by	<	0.0079	<	<	<	<
	c	<	<	<	<	<	<
QA/QC							
Metal duplicate	bb	<	<	<	<	<	<
min		0.025	0.0003	0.005	0.000025	0.0025	0.05
max		0.025	0.25	0.01	0.00024	0.0025	0.05
median		0.025	0.0003	0.005	0.000025	0.0025	0.05
mean		0.025	0.019627	0.005333	0.000047	0.0025	0.05
standard deviation		0	0.063923	0.001291	6.11E-05	0	0
ODWO							
MAC	mg/L		0.01				0.1
IMAC	mg/L					0.025	
Proposed (1996)	mg/L					0.010	
Health Canada (1998)	mg/L		0.008				
GUCS	mg/L	0.1	0.01	0.1	0.0012	0.025	

Note:

RL	Laboratory reporting limit
<	Less than RL
ODWO	Ontario Drinking Water Objectives, Table 1-Chemical/Physical Objectives, revised 1994
GUCS	Guideline for Use at Contaminated Sites in Ontario, Table A for a Potable Groundwater Condition, revised 1997
Proposed (1996)	Draft - Rationale Document for the Development of Soil, Drinking Water, Surface Water, and Air Quality Criteria for Arsenic, February 1996, Standards Development Branck, OMOE
MAC	Maximum Acceptable Concentration
IMAC	Interim Maximum Acceptable Concentration

For calculation purposes, 0.5*RL used for all sample concentrations less than RL
min, max, mean, and std. dev does not include duplicate

Appendix D.16: Deloro Drinking Water Wells Analyzed for Radionuclides
Sample media Groundwater

	Study ID	Flushed Samples (Radionuclides)									
		Ra-226	Pb-210	Po-210	Cs-137	I-131	Sr-90	Tritium	Th-230	Th-232	
		Bq/L	Bq/L	Bq/L	Bq/L	Bq/L	Bq/L	Bq/L	Bq/L	ppb	Bq/L
RL		0.01	0.5	0.01	1	1	1	1000	0.01	1	0.00407
	bn	<	<	<	<	<	<	<	-	-	-
	bv	<	<	<	<	<	<	<	-	-	-
	bu	<	<	<	<	<	<	<	-	-	-
	br	<	<	<	<	<	<	<	-	-	-
	bt	<	<	<	<	<	<	<	-	-	-
	bl	<	<	<	<	<	<	<	<	<	<
	bf	<	<	<	<	<	<	<	<	<	<
	bb	0.02	<	<	<	<	<	<	<	<	<
	bh	<	<	<	<	<	<	<	<	<	<
	c	<	<	<	<	<	<	<	<	<	<
	bm	<	<	<	<	<	<	<	0.01	< 2	<0.00814
	bw	0.01	<	<	<	<	<	<	<	<	<
	by	<	<	<	<	<	<	<	<	<	<
	bs	<	<	<	<	<	<	<	<	<	<
	bi	<	<	<	<	<	<	<	0.01	<	<
min		0.005	0.25	0.005	0.5	0.5	0.5	500	0.005	0.500	0.002
max		0.02	0.25	0.005	0.5	0.5	0.5	500	0.010	1.000	0.004
median		0.005	0.25	0.005	0.5	0.5	0.5	500	0.005	0.5	0.0020
mean		0.0063	0.25	0.005	0.5	0.5	0.5	500	0.006	0.550	0.002
standard deviation		0.0040	0	0	0	0	0	0	0.002	0.158	0.001
Radionuclide Duplicate	bl	<	<	<	<	<	<	<	-	-	-
Trip blank	--	<	<	<	<	<	<	<	-	-	-
Guidelines											
ODWO		1			50	10	10	7000			
Health Canada - Criteria		0.6	0.1	0.2	10	6	5	7000	0.4		0.1

Note:

Th-230, Th-232 Ra-226, Po-210 measured by Alpha Spectrometry
Pb-210 and Sr-90 measured by Beta Counting
Tritium measured by Liquid scintillation
Cs-137 and I-131 measured by Gamma Spectroscopy
Po210 results indicate activity on date analyzed
Bq/L - becquerels per litre
ppb - parts per billion

< Less than reporting limit
\- Parameter not analyzed

For min, max, average and std. dev., 0.5*RL used for values less than RL

Appendix D.17: Deloro Drinking Water Wells (flushed) Metals Analysis

Sample Media Groundwater
All wells sampled October 14/98 except replicate (October 15/98)

Sample ID	Study ID	Cobalt mg/L	Lead mg/L	Nickel mg/L	Silver mg/L	Arsenic mg/L	Uranium mg/L
RL		0.05	0.0006	0.01	0.00005	0.005	0.10
	bb	<	<	<	<	<	<
	bf	<	<	<	<	<	<
	bh	<	<	<	<	<	<
	bi	<	<	<	0.00011	<	<
	bl	<	<	<	<	<	<
	bm	<	<	<	0.00012	<	<
	bn	<	<	<	<	<	<
	br	<	<	<	0.00011	<	<
	bs	<	<	<	<	<	<
	bt	<	<	<	<	<	<
	bu	<	<	<	<	<	<
	bv	<	<	<	<	<	<
	bw	<	<	<	<	<	<
	by	<	0.0068	<	<	<	<
	c	<	<	<	<	<	<
QA/QC							
24-hour replicate	bl	<	<	<	<	<	<
Trip blank		<	<	<	<	<	<
Min		0.025	0.0003	0.005	0.000025	0.0025	0.05
Max		0.025	0.0068	0.005	0.00012	0.0025	0.05
Median		0.025	0.0003	0.005	0.000025	0.0025	0.05
Mean		0.025	0.000733	0.005	4.27E-05	0.0025	0.05
Standard Deviation		0	0.001678	0	3.66E-05	0	0
ODWO							
MAC	mg/L		0.01				0.1
IMAC	mg/L					0.025	
Proposed (1996)	mg/L					0.010	
Health Canada (1998)	mg/L		0.008				
GUCS	mg/L	0.1	0.01	0.1	0.0012	0.025	

Note:

RL	Laboratory reporting limit
ODWO	Ontario Drinking Water Objectives. Table 1 Chemical/Physical Objectives, revised 1994
GUCS	Guideline for Use at Contaminated Sites in Ontario, Table A for a potable groundwater condition, revised February 1997
Proposed (1996)	Draft - Rationale Document for the Development of Soil, Drinking Water, Surface Water, and Air Quality Criteria for Arsenic, February 1996, Standards Development Branck, OMOE
MAC	Maximum Acceptable Concentration
IMAC	Interim Maximum Acceptable Concentration

Tap flushed for 5 minutes before sample collected
For calculation purposes, 0.5*RL used for all sample concentrations less than RL
min, max mean and std dev does not include duplicates or blanks

Appendix D.18: DELORO MUNICIPAL WELL - METALS ANALYSIS
Study ID m

PARAMETER	UNITS	Sampling Date		ODWO Criteria			GUCS
		1994 17-May OCWA	1998 14-Apr OCWA	MAC	IMAC	Proposed (1996)	
arsenic	mg/L	0 0051	<0.01		0 025	0.010	0 025
cobalt	mg/L	<0 00002	<0 004				0 1
lead	mg/L	0 00007<T	<0.002	0 01			0 01
nickel	mg/L	<0 0002	<0 01				0 1
silver	mg/L	<0.00005	-				0 0012
uranium	mg/L	0 00026<T	<0 1	0 1			

Notes:

- = not analyzed
<T = a measurable trace amount, interpret with caution

ODWO	Ontario Drinking Water Objectives, Table 1 Chemical/Physical Objectives, revised 1994
GUCS	Guideline for Use at Contaminated Sites in Ontario, Table A for a potable groundwater condition, revised February 199
Proposed (1996)	Draft - Rationale Document for the Development of Soil, Drinking Water, Surface Water, and Air Quality Criteria for Arsenic, February 1996, Standards Development Branck, OMOE
MAC	Maximum Acceptable Concentration
IMAC	Interim Maximum Acceptable Concentration

All results are for final effluent

Appendix D.19: DELORO MUNICIPAL WELL - RADIONUCLIDE ANALYSIS
Study ID: m

PARAMETER	UNITS	1998 22-Jul OCWA	1998 15-Oct CG&S	ODWO Criteria	Health Canada Backgrounds
Cs-137	Bq/L	<1		50	10
I-131	Bq/L	<1		10	5
Ra-226	Bq/L	<0.1		1	0.6
Sr-90	Bq/L	<1		10	6
H-3	Bq/L	<1000		7000	7000
Th-230	Bq/L		<0.01		0.4
Pb-210	Bq/L		<0.5		0.1
Po-210	Bq/L		<0.01		0.2
U-238	ppb		<1		
	Bq/L		<0.0123		4
Th-232	ppb		<3		
	Bq/L		<0.01221		0.1

Notes:

<T = a measurable trace amount, interpret with caution
Th-230, Po-210 measured by Alpha Spectrometry
Pb-210 measured by Beta Counting
Po210 results indicate activity on date analyzed
July 22, 1998 results are for final effluent; Oct 15, 1998 results are for untreated water